DOCUMENT RESUME

ED 252 866 CS 208 736

AUTHOR Carson, David L., Ed.
TITLE The Council for Programs in Technical and Scientific Communication Proceedings (5th, Troy, New York, April 19-21, 1978).
INSTITUTION Council for Programs in Technical and Scientific Communication.
PUB DATE Apr 78
NOTE 109p.; For 1974-1984 conference proceedings, see ED 132 630, CS 208 733 and CS 208 735-742.
PUB TYPE Collected Works - Conference Proceedings (021) -- Reports - Descriptive (141) -- Viewpoints (120)

EDRS PRICE MF01/PC05 Plus Postage.
DESCRIPTORS *Communication Skills; Computers; Course Content; Design; Editing; *Education Work Relationship; English Instruction; Foreign Countries; Graphic Arts; Higher Education; Interdisciplinary Approach; *Production Techniques; *Professional Associations; *Program Content; Program Development; Research Needs; *School Business Relationship; *Technical Writing; Technological Advancement; Training Methods

ABSTRACT

Prepared by representatives of industry, government, and the educational community, the papers in this collection were drawn from a conference that addressed a variety of issues of interest to the field of technical communication. Specific topics discussed in the papers are as follows: (1) the role of the Society for Technical Communication in education, (2) design as a communication model, (3) the role of the technical communicator in the computer industry, (4) applications of communication theory and cybernetics to technical communication, (5) Miami University's (Ohio) undergraduate English major with an emphasis in technical writing, (6) an interdisciplinary course in technical writing at the University of Florida, (7) the teaching of technical communication in Australia, (8) Old Dominion's program to train apprentice editors, (9) a course on graphics and audiovisuals in technical communication at Rensselaer Polytechnic Institute (RPI), (10) a cooperative editing program developed by the New York Sea Grant Institute and RPI, (11) some beginnings in research for technical communication, and (12) the intergovernmental mobility program. (FL)

****
* Reproductions supplied by EDRS are the best that can be made *
* from the original document. *
****

ED252866

U.S. DEPARTMENT OF EDUCATION
NATIONAL INSTITUTE OF EDUCATION
EDUCATIONAL RESOURCES INFORMATION CENTER (ERIC)
X This document has been reproduced as received from the person or organization originating it.
Minor changes have been made to improve reproduction quality.
• Points of view or opinions stated in this document do not necessarily represent official NIE position or policy.

PROCEEDINGS

of

THE COUNCIL FOR PROGRAMS IN TECHNICAL AND SCIENTIFIC COMMUNICATION

"PERMISSION TO REPRODUCE THIS MATERIAL HAS BEEN GRANTED BY

Patrick M. Kelley

TO THE EDUCATIONAL RESOURCES INFORMATION CENTER (ERIC)."

April 1978

Rensselaer Polytechnic Institute

Troy, New York

2

CS 208 736

Printed at Troy, New York

1979

Under the Auspices of

The Technical Writers' Institute

Professor B. Frank Hammet,
Director,

and

The Technical Writing Institute
for
Teachers

Professor David L. Carson,
Director

PREFACE

The fifth annual meeting of The Council for Programs in Technical and Scientific Communication convened at Rensselaer Polytechnic Institute on April 19, 1978 under the sponsorship of the Department of Language, Literature, and Communication. In attendance were seventeen members and nine participating guests.

Typical of past meetings, the 1978 meeting was a significant undertaking in the world of technical communication because it provided a forum in which industry, government, and academia could address matters of importance both formally and informally. The material which follows illustrates beyond doubt that the Council has acquired important status among the leaders of the field which extends beyond the confines of the nation's colleges and universities to IBM, Data General, SYSDOC, the American Business Communication Association, and to Australia's Queensland Institute of Technology.

After honoring Professor Thomas E. Pearsall, Founding President, for his visionary leadership throughout the Council's first five years, the following newly elected officers formally assumed their responsibilities;

President	Thomas L. Warren
Vice President	David L. Carson
Secretary	Virginia Book

Treasurer James E. Connolly

Member
at Large Richard M. Davis

At the meeting's close, the Council formally accepted the invitation of its new president to hold the 1979 meeting at Oklahoma State University.

David L. Carson,
Editor and
Vice President

TABLE OF CONTENTS

President's Opening Remarks
Thomas E. Pearsall 1

Some Remarks on Technical Communication
Jay R. Gould 4

Report From the Member at Large
Virginia Book 11

STC and Its Role in Education
B. Frank Hammet 12

Design as a Communication Model
Philip M. Rubens 17

A View From the Computer Industry
Joseph T. Rigo 27

Applications of Communication Theory and Cybernetics to Technical Communication
George A. Barnett 29

An Undergraduate English Major with an Emphasis in Technical Writing
Paul V. Anderson 47

An Interdisciplinary Course in Technical Writing
Wayne A. Losano 56

The Teaching of Technical Communication in Australia
Thomas C. Dixon 58

Training Apprentice Editors
Freda F. Stohrer 62

A Course on Graphics and Audiovisuals in Technical Communication
David L. Carson and Craig Harkins. 69

Recipe for a Cooperative Technical Editing Program
Bruce M. Kantrowitz 73

Some Beginnings in Research for Technical Communication
Leon C. Hull. 89

Intergovernmental Mobility Program 97

List of Participants 1978 Meeting 102

PRESIDENT TOM PEARSALL'S OPENING REMARKS

Dave Carson has asked me to begin this year's meeting with a few historical remarks. As I think most of you know, the Council was formed, though not named, in 1974 at the University of Minnesota. It came about, as do many ideas both good and bad, in a relaxed moment while several of us were sitting around sipping coffee.

"Wouldn't it be nice," somebody said, "if we could get together with all the other folks interested in professional technical communication programs."

We talked rather idly for a while of the things we might discuss at such a meeting: problems and challenges, the balance between specialized and generalized training, job opportunities, internships, standards, and so forth.

At that moment, I remembered an organization I had belonged to while I taught at the Air Force Academy. It was a loosely knit group called the Association of Directors of Freshman Composition. We met every other year at a member school. Our meetings were highly informal. We would sit around discussing our mutual concerns. People who were experimenting with new techniques would take the floor for an extended period to tell us what they were doing and how it worked. It was a first-class information exchange with many serendipitous interactions. (Those of you of know me best know that I'm a great believer in serendipity.)

At any rate, the thought of having such meetings among people concerned with technical communication programs appealed to me. We sent out meeting invitations to 20 schools and received responses

from 12 or 13, saying, "Yes, we'll be there, good idea."

We had a fine meeting at Minnesota in the spring of 1974. We decided it was a forum worth repeating, and as a result we formed an association without bylaws or a constitution and decided to meet again the following year. We have met every year since--at Boston University, Colorado State University, Minnesota again, and this year at RPI--and have proceedings for every year but one. Anyone who would like copies of them can have them for the cost of xeroxing and postage. Write to me.

Since the beginning we've formalized things a bit. We decided we needed a name and after much discussion ended up with Council for Programs in Technical and Scientific Communication. We tried to get an acronym, but never could come up with anything that wasn't mildly obscene. We added dues, $15.00 per year. We've added members. Probably half the schools who should belong now do.

We also wrote a constitution. We did that for a particular reason. We learned two years ago that the only way for an organization such as ours to have any official standing at all is for it to obtain tax-exempt status from the IRS. You cannot get such status unless you have a constitution. So, we now have a minimum constitution and your Treasurer, Jim Connolly, is about two-thirds of the way toward obtaining tax-exempt status for us. He has had to fill out a stack of forms that exceeds in volume the proceedings for the last four years.

As part of having a constitution, we elected officers, and I've had the pleasure of serving as your president for three years. It's time for me to step down and if you elect the slate of officers nominated, Tom Warren will soon be your president. I wish him well.

I do, however, have a parting presidential remark or two. The first would be to urge you not to formalize things too much. The joy and value of these meetings come from our spending a few leisurely, informal days together, in discovering our common concepts and challenges, in putting a face to what has before been a signature on a letter. Too much formality, too much planning, too many speeches could reduce the serendipity level.

Secondly, I think a major goal of the Council should be to bring in the other schools who should be members. They have a stake in our future, and we should enlist them.

So, thank you all for your help and cooperation over the years. May we continue to prosper.

SOME REMARKS ON TECHNICAL COMMUNICATION

JAY R. GOULD

RENSSELAER POLYTECHNIC INSTITUTE

First of all, I would like to have you recall how far already the teaching of technical communication has progressed and the world-wide contacts that have been made with this discipline. I don't know how much you keep up with the things, but as editor of a technical writing journal I get a good deal of feedback and reporting from various countries. At times it enables me to get information about all the interesting things being accomplished in communication. We have a tendency to be rather parochial in our thinking.

So, in addition to the Society for Technical Communication, the American Business Communication Association, and the American Medical Association, consider other professional activities.

For example, in Australia is the Australian Association for Technical Communication, which is largely based in Sydney. At the moment this organization is floundering a bit largely, I believe, because of its geographical location. There are technical writing teacher in various centers -- Sydney, Melbourne, Brisbane, and I think thet we could help these people, not in a patronizing way, but by making certain that they receive from us curriculum descriptions, study plans, reprints, and anything else that would expand their capabilities.

You also know that in England is a powerful group -- The Institute of Scientific and Technical Communication. It's possible that this group predates our own STC.

We could name a dozen prominent figures from Great Britain who have established close contact with american teachers. Only recently John Kirkman of the University of Wales Institute of Science and Technology has edited a Proceedings of a one-day Conference held at Cardiff. This was international in scope with talks by Robert Rathbone, MIT; and Cline Bruchman, the University of Witwatersrand; and with a number of British colleges and technical institutes represented.

There are societies in the Netherlands, Norway, Sweden. The Swedish Society is particularly active under the leadership of Lars Forslund and Ulf L. Andersson.

Personally, I was most interested in a recent visit to Rensselaer by Dr. Jan Broer, an editor at the N.V. Philips Research Laboratories, Eindoven, the Netherlands. The Philips Magazine on which Dr. Broer works comes out in four languages; Dr. Broer is on the English language staff. The field of translation and language adaptation could stand some investigation by our own American groups.

Israel, as some of you already know, at one time had a flourishing group of technical communicators, but lately it has been inactive. However, under the general leadership of Miram Balaban, the First International Conference of Scientific Editors met at the Hebrew University in Jerusalem. One result has been a most impressive publication containing papers by world-famous editors and teachers. Try to get a copy of these proceedings; you will be amazed at the scope of the topics listed.

About a year ago, John Kirkman attended the organization meeting of the Association of Technical Communicators (France). He subsequently reported on this for the Journal of Technical Writing and Communication.

I have correspondence every so often with Jacques Richardson, editor of the United Nations Journal in Paris, Impacton Society. Mr. Richardson has recently reported on a workshop held in luxembourg. The title of this particular session was The Popularization of Science Through Television, attended by European specialists. Another facet of scientific and technical communication that we might look into.

I have a suggestion and it is this: that on our various Euopean travels we take the time to make contact with some of these people and organization.

Here are some more thoughts on the state of technical writing.

- We should take a good, hard look at what passes for research. We should ask ourselves; Does research in technical communication have any real connection with research in the humanities? I'm not sure what that means. Does research in communication have characteristics in common with research in literature, in rhetoric, as the social sciences? I think that it is possible that it does.

This aspect of technical writing needs to be refined by some organization. It might as well start with this one. We are doing little service to ourselves to accept anything that calls itself research and scholarship. This aspect of communication is very important to teachers because it involves tenure, promotion, and equality with other disciplines.

- Another point I would like to make is that we should look into the roots of technical communication. Are we belaboring the point when we place technical writers with science writers and medical writers and engineering writers.

In order to get an answer on this, I would like to see more work done on the great technical and science writers of the past. There are some very encouraging signs that interest me. This phase of technical writing is increasing. In my own journal I an now getting papers on technical writers of the past by Wayne Losano, Merrill Whithrun, and Stephen Gresham, to name only three.

Another point which follows logically is the relationship between teachers of technical writing on the one hand and teachers of the humanities on the other. A number of papers on this subject have been given at conferences and published in journals. We have at times been characterized as second-class citizens and hacks because of our own narrow specialization. So what we must do, I think, is to upgrade ourselves. We must encourage research and hold our students to certain standards of expression. Perhaps through this association, we should devise a code that will spell out what is expected of a truly professional teacher of technical communication. We should have more than a nodding acquaintance with the societies of communication theory such as the National Communication Society.

My last point is that I would like to advocate more exchange of technical writing teachers. It would be excellent if some advisory committee could be set up to make it possible for teachers to accept temporary exchange appointment with other teachers. It's very easy to become fixed in one's job, to lose sight of the fact that there are other kinds of students than those one is accustomed to.

Now, I believe, is the time to open this session to some comments.

Comment:

Right now I'm being reviewed for tenure and promotion by a group of traditional English teachers.

They honestly have no way to pass judgment on my publications. Is there any way to handle this problem?

Answer:

It's becoming more common at schools for individuals to insist that they be evaluated by peer groups outside their own universities. The field of technical writing has many top-flight teachers who are certainly more qualified to pass judgment than the traditional English teachers. My advice would be to build up a roster of acknowledged authorities with technical communication and call these to the attention of those responsible for tenure.

Comment:

One of the things which I found interesting, and it might not work for all of us but at Michigan the technical writing people are from the Department of Humanities in the College of Engineering. Their situation is special. What they have done, is to go to the engineers and say what are your standards for promotion and tenure? This actually established within their own department standards close to the engineers. Does this sound logical?

Answer:

That's only half the problem really. Engineers are more inclined to be sympathetic toward us than the humanists, because they usually understand what we are trying to do. As far as the humanists are concerned, I don't know that they have an exclusive understanding of what constitutes research. Quantity is often confused with quality.

Comment:

I don't feel the least apologetic about what I'm doing. I'm in the English department and I sit in judgment of the Renaissance

people and on the others... and I'll read their publications and they can read mine. You say that their research to me doesn't seem very much like good research in many cases, but we have other standards. The publications in your journal: this is pretty acceptable evidence, no matter what your field is. And the reviews you get for books and such things are pretty acceptable evidence, no matter what the field. I'm not going to sit back and say that because I'm in the business of technical writing that I'm going to bow out and not be responsible for passing out promotions of other people, because they're going to pass on my people.

Comment:

While we're talking about status, there might be one other point we might make upon this week. I was talking to some people in Ft. Collins about this, and I had a chance for a position there, but I felt that stepping into a technical writing program offered by a journalism department was a step down. I probably shouldn't feel that way, and I just wondered if anything was going to be addressed along this line.

Comment:

I kind of agree, except that I think that by an accident of history the program at Ft. Collins, which was intended to be a technical communications program when founded by Dr. Herman M. Weisman back in '59 and '60, was called technical journalism because at that time it was so new that Dr. Weisman didn't want to have to explain technical communication. Unfortunately, after he left, all that were left were some of the journalism people. So people started callind it the Journalism Department. Technical Journalism was too big a mouthful. You feel comfortable with what you know. So they got stronger and stronger and pretty soon, out of 400 majors, maybe 30 were technical writers and 420 were newspaper majors and it just

grew in a different direction. It did seem to be a vanishing kind of program. As far as technical communication was concerned.

Comment:

The journalism people that I've encountered seem to be extremely narrow in their concept of writing and still have what I call a Clark Kent Syndrome. You're going to dash in in shining armor and expose Watergate . and there is only one kind of writing and that is journalism writing; there is only one kind of organization, the newspaper organization, and anything else is really not very important.

The Society for Technical Communication and Its Role in Education

Frank Hammet
Chairman; Education and
Development Committee

The Education and Development Committee will assist the Society in meeting its educational responsibilities by (1) evaluating career potentials in technical communication and encouraging this career as a goal; (2) encouraging and assisting in the development of effective curricula in educational institutions; (3) promoting programs of effective in-plant training, continuing education, and professional self-development; (4) promoting research in the field; and (5) administering the Society's scholarship program. To achieve its purposes, the Committee:

> Investigates the present nature, extent, and effectiveness of educational activity within the Society and in the profession of technical communication as a whole.
>
> Issues reports on the results of its investigations, when appropriate to do so.
>
> Studies the means for beginning, improving, or increasing educational activity which the Society and its Chapters can undertake themselves or might propose to others.
>
> Develops and administers, as required, programs for promoting improved or increased educational activity.
>
> Prepares publications which will assist in carrying out such programs.
>
> Provides information and advice on educational matters to individuals (members of the Society or nonmenbers); and to other committees and the Board of Directors of the Society.
>
> Recommends to the Board of Directors policies and procedures related to the role which the Society and its Chapters should play in professional education.

The Education and Development Committee is composed of the chairman and four subcommittee chairmen whom he appoints. These subcommittees have responsibility for a particular area of the full Committe's work: career promotion, curriculum development, professional development, and research. Each subcommittee chairman appoints the members of his group, without restrictions as to number; however, he makes every effort to include illustrators, as well as writers and editors, on his subcommittee.

REPORT FROM THE MEMBER AT LARGE TO
THE COUNCIL FOR PROGRAMS IN TECHNICAL AND
SCIENTIFIC COMMUNICATION

Rensselaer Polytechnic Institute
April 19-20, 1978

During the meeting of the Council at the University of Minnesota in 1977, a suggestion was made that the Council contact organizations that might be interested in the materials we have compiled on programs. The member at large was charged with the responsibility of identifying such organizations. The list is attached.

It seems to me there are some decisions to be made about the logistics of disseminating the information we have collected. Some questions that need to be answered are:

1. Who shall be responsible for contacting the organizations?
2. Who shall be responsible for determining the price for the packets?
3. Who shall be responsible for printing the packets?
4. Who shall be responsible for keeping the organizational list up to date?
5. Shall the person who contacts the organizations be the same person who sends out the packets?
6. Should some organizations be sent free packets as a public relations gesture?

There are other questions that need to be answered, but those listed above are some of the most relevant. All of them are based on the assumption that the Council does still wish to make the program materials available to various organizations.

I hope that each person at this meeting will take time to read through the attached list of organizations and suggest any additions (or deletions). Please send your information to:

Professor Virginia Book
108 Ag. Communications
University of Nebraska
Lincoln, NB 68583

ORGANIZATIONS TO CONTACT ABOUT PROGRAMS IN TECHNICAL AND SCIENTIFIC COMMUNICATIONS

Adult Education Association of the U.S.A.
810 18th St. N.W.
Washington, D.C. 20006
Charles B. Wood
Executive Director

Advertising Research Foundation
3 E. 54th St.
New York, N.Y. 10022
Paul E. J. Gerhold
President

American Association of Advertising Agencies
200 Park Ave.
New York, N.Y. 10017
John Crichton
President

American Association of Schools & Depts of Journalism
5172 Vilas Communication Hall
University of Wisconsin
Madison, WI 53706

American Business Communication Association
317b David Kinley Hall
University of Illinois
Urbana, IL 61801
Francis W. Weeks
Executive Director

American College Admissions Center
American College/Career Center
1601 Walnut St.
Philadelphia, PA 19103
Dr. Henry Klein
President

American Council on Education for Journalism
School of Journalism
University of Missouri
Columbia, MO 65201
Dr. Milton Gross
Secretary-Treasurer

American Medical Publishers' Association
c/o Niels Buessem
John Wiley & Sons
605 Third Ave
New York, N.Y. 10016

American Personnel and Guidance Association
1607 New Hampshire Ave., N.W.
Washington, D.D. 20009
Charles L. Lewis
Executive Vice Pres.

American Schools Association
24 N. Wabash Ave.
Chicago, IL 60602
Carl M. Dye
President

American Society for Engineering Education
One Dupont Circle, Ste. 400
Washington, D. C. 20036
Donald E. Marlowe
Executive Director

Association for Education in Journalism 102 Reavis Hall Northern Illinois University De Kalb, IL 60115	Quintus B. Wilson Executive Secretary
Association for Educational Communications and Technology (Audio Visual) 1201 16th St. N.W. Washington, D.C. 20036	Howard Hitchens, Jr.
Associated Writing Programs Washington College Chestertown, MD 21620	
Association of Teachers of Technical Writing English Department University of Texas Austin, TX	John Walters President
Aviation/Space Writers Association Cliffwood Rd. Chester, N.J.	William Kaiser Executive Secretary
College Admissions Assistance Center 888 7th Ave. New York, N.Y. 10019	Robert L. Lincoln Executive Director
College Conference on Composition and Communication 1111 Kenyon Rd. Urbana, IL 61801	Robert F. Hogan Executive Sec.-Treas.
Conference on English Education 1111 Kenyon Rd. Urbana, IL 61801	
Cooperative Education Association Drexel University Philadelphia, PA 19104	Stuart B. Collins Executive Director
Education Writers Association P.O. Box 858 Ansonia Station New York, N.Y. 10023	JoAnn Booth Executive Director
Institute of Electrical and Electronics Engineers Group on Professional Communications 345 E. 47th St. New York, N.Y. 10022	
International Association of University Professor of English English Dept. University of Keele Staffordshire, St5 5BG, England	John Lawlor Secretary Treasurer
International Audiovisual Society P.O. Box 54 Cullowhee, N.C. 28723	Dr. Paul Flynn President

International Communications Association
P.O. Box 445
Flint, MI 48502

Modern Language Association of America
62 Fifth Ave.
New York, N.Y. 10011

National Association of College Admissions Counselors
9933 Lawlor, Ste. 500
Skokie, IL 60076
Ted S. Cooper
Executive Director

National Association of Management Education
c/o Dr. John H. Carmichael
Essex County College
31 Clinton St.
Neward, N.J. 07102

National Association for Professional Associations and Corporations
P.O. Box 14168
Gainesville, FL 32601
J. R. Hume
President

National Association of Science Writers
Box H
Seacliff, N.Y. 11579

National Career Information Center
c/o American Personnel and Guidance Association
(address listed previously)

National Conference of Editorial Writers
1725 N St. N.W.
Washington, D.C. 20036

National Conference on Research in English
800 Moredon Rd.
Meadowbrook, PA 19046

National Council of Teachers of English
(address same as CCCC)

National Council of Technical Schools
(address unknown)

School and College Advisory Center
366 Madison Ave.
New York, N.Y. 10017
Hans K. Maeder
Director

Society of American Business Writers
The Washington Post
1515 L St. N.W.
Washington, D.C. 20071
Hobart Towen

Society of Governmental Appraisers
114 Cuyama Rd.
Ojai, CA 93023

A.B. Hunter
Executive Director

Society for Technical Communications
Suite 421
1010 Vermont Ave. N.W.
Washington, D.C. 20005

Speech Communication Association
Statler Hilton
New York, N.Y. 10001

United Student Organization
5704 Longview Rd.
Kansas City, MO 64137

James W. Kunz
President

Design As A Communication Model

In an intriguing article in Science, Walter R. Lynn maintains that engineering schools throughout the country fail to educate their graduates to meet today's demands because their curricula are based solely on the teaching of analytical skills. To counter this trend, he suggests that such schools should devote more of their energies to "Design" education. This kind of focus, he implies, gives the student the opportunity to synthesize knowledge. In his view analysis and synthesis are essential and complimentary aspects of an engineering curriculum.

Since engineering courses lack this design element, where can a student get such a background? Once again, Lynn posits that the missing factor is an emphasis on values, which should be available in humanities and social science courses. However, he also sees that a basic division in teaching technique creates a barrier for the technological student in understanding the importance of these courses. For most students, they are simply electives, a formality.

This is probably a reaction to a perceptible difference in pedagogical approaches between liberal arts and engineering classes. D. Bell outlines three different methods in which students are asked to assimilate knowledge. In the sciences, students acquire information in sequential blocks; chemistry 101 always precedes chemistry 102. With the possible exception of freshman composition, humanities understanding can be characterized as concentric. Different approaches to common themes lead to a sense of understanding. Finally, learning in the social sciences can be described in terms of linkages; the student must recognize the interaction of various systems. Given such diversity in pedagogy, it is understandable that any student should have some difficulty in comprehending the

value of certain courses. They must continually shift between the pragmatic, "results" orientation of technical programs and the "process" focus of the humanities and social sciences.

In addition to this pedagogical fragmentation, there is also a prevailing sense of confusion about the nature of communication and the appropriate method for teaching communication, even when based in design, to technological students. A good analysis of this problem can be made by referring to James Kinneavy who divides discourse into four parts: expressive, referential, literary, and persuasive. Two of these--expressive and literary--have little to offer the technologist. In fact, expressive is characterized as communication whose aim is to somehow please only the writer; it lacks any interest in the audience. The second category, literary, deals with fictional writing for entertainment; its only place in relation to the communication demands of the technologist is to dramatize a particular problem or situation. Good science-fiction is an example of the value of such writing and, of course, could be useful as a basic literary class for engineers and scientists. The remaining categories--persuasive and referential--offer the most importance for the technologist. The former is useful because it most consciously addresses an identifiable audience (as in advertising, speeches, and editorials), while the latter--referential--is the very heart of scientific writing. It is exploratory, scientific, and informative. Included in this classification are seminars, proposals, diagnoses, proofs, theses, news articles, and reports, as well as a variety of other communication efforts which deal with reality.

Despite these basic problems, the supposed dichotomy between technology and the humanities should have little effect on education. In fact, many technologists discuss their work in terms of design concepts that are indeed compatible with humanistic or, better yet, interdisciplinary education. George Nelson, for instance, consciously chooses to approach design as a communication activity.

He claims that such an attitude places considerable social responsibility on the designer. In Nelson's system, design is explored in emotional terms as well as analytical. That is, he considers a broad spectrum of social concepts before he arrives at a solution to a technological problem. Somehow, someone, somewhere has been affected by the design principle.

So far, we have discussed the shortcomings found in today's schools of science and technology. We have also seen that one avenue for alleviating these problems--humanities and social science design-oriented courses--is effectively blocked by an artificial barrier created by diverse pedagogical methods. Yet, there seems to be some technologists who have found their way to design. Interestingly enough, they maintain that such an approach seems to them to be related to communication. It is this observation concerning the relationship of design and communication which, I think, can be used effectively to discover a common ground between the technologists' and the humanists' education and serve as a basis for a new model of communication.

The concept of design as suggested by Lynn and Nelson is a problem-solving activity which can be used to pattern a task toward a desired end. It requires a conscious effort to impose meaningful order. Since each of us is different, and indeed we are different people/writers on different occasions, the processes of design, the acquisition of information, and the organization and presentation of our work will necessarily be highly subjective. The same is true for both the technologist and the writer.

Since contemporary rhetorical theory has never considered this relationship, it is necessary to establish exactly how design fits into the discipline of writing. One school, which promotes pre-writing, thinks that a great deal of a writer's work occurs even before putting pen to paper. This approach is closely allied to the introspective nature of design. In fact, even an Aristotelian

rhetorician would agree that one tries to discover exactly what ones topic is by a conscious examination of both external and internal sources. This, of course, is simply another way of describing "invention," the process of mapping out the "topos." Unfortunately, invention lost importance as science began to depend more and more on direct examination of the physical world. Once again, there occurred another split in the humanities and technology. Kenneth Pike sees this division as one of technical procedures versus heuristics; the former is rule governed to arrive at the same results, while the latter simply posits questions that guide inquiry. He goes on to describe the systematic approach of heuristics which bears a remarkable resemblance to the aims of design: discover information in the mind, discover information outside the self, and prepare the mind for the intuition of some ordering principle.

What Pike delineates is the same ordering principle that can be found in the design process. However, the design process develops this principle even further. In the design continuum there is an especially close relationship between the various activities. Joseph Schillinger, in his book, The Mathematical Basis of the Arts, for instance, maintains that scientific thinking tends to unite seemingly different categories into complex unities. Such a phenomenon, he suggests, indicates that scientific thought is a process of synthesis. Similarly, Bruno Rossi points out that scientific research begins with observation progresses to analysis, comparison, grouping, and synthesis until a picture emerges that satisfies man's natural desire for order and harmony. I have already suggested that this close relationship of analysis and synthesis is essential to design.

Analysis is decidedly the starting point for both the scientific and design processes. The same is, or should be, true for the writer. Analysis divides the problem; it asks questions in an effort to define the problem. During this

phase of the design process, the major emphasis is on establishing a field of investigation, its characteristics, features, and qualities. It is also a time for making decisions about audience and writing strategies. Ideally such an analysis should lead to a definition of terms as well as the problem. Writers traditionally have been accustomed to referring to this step as research, invention, or pre-writing. During this phase, the writer explores what he knows about the subject. Edward Hall maintains that such an exploration begins with what the writer knows about the topic: is it a question of fact, definition, or quality? After examining such data, the writer goes on to discover how much information he can gather from external sources--books, documents, interviews, recordings, direct observation, and so on. During this search, the topic can be evaluated in many ways based on need, function, and use. At this stage, Middleton suggests that planning, foreseeing, compromising, and social concerns begin to enter the design continuum. Both the designer and the writer filter their materials to arrive at a workable solution and approach to their tasks. This filtering process, K. W. Norris claims, leads to a reduction of questions and an increase in answers. Finding these answers is best accomplished in the design process by a morphological technique. That is, the designer determines the terms of reference, establishes the investigative field, examines the various possible relationships, and presents acceptable solutions. This analysis stage includes a variety of tasks necessary to meet social needs that progressively impinge upon the writer/designer's tasks.

The synthesis stage of the design process cannot be clearly separated from analysis. As I suggested, during analysis questions are posited which hopefully can be answered to some degree. The extent to which reasonable solutions are found determines the quality of both analysis and synthesis and, consequently, the communication. Norris maintains that the answers suggested by analysis leads

to new assumptions and the elimination of irrelevant material. This procedure describes quite accurately another method, one formulated for the designer, for the rhetorical concept of invention. In fact, the procedure accounts for many areas which have been traditionally vague in the rhetorical concept. Bridging this gap between design in the technological sense and its use for the writer of technical material should be an easy task.

In previous paragraphs, I have pointed ou that the design continuum plays an important role in focussing the thinking of the technologist on social concepts. I also implied that this was true of the writer. When Nelson wrote of design as a communication activity, he also went on to qualify that statement by saying that design was social communication in which the object did not matter as much as the emotional intensity with which the essentials had been explored. In this sense both writing and designing represent a way of working out our own thinking about something. However, since Nelson sees the entire operation as communication, I am certain that he would agree that information of some kind must be transferred. While the design continuum is essentially a creative act founded on introspection as well as deliberate research which is sternly subjected to both analysis and synthesis, it is also controlled by a series of basic design principles which are necessary to a successful design. At any one time it would be impossible to have universal agreement about these design principles; however, they usually include modes, applications, telesis, necessities, associations, and aesthetics.

Design modes simply means the interaction of tools, processes, and materials. In the case of writing, tools include any type of media that can be used to communicate--both print and non-print. They even include non-verbal communication behavior such as body language. Processes are the ways in which we choose to present a communication--debates, ads, speeches, essays, short stories, poems,

narratives, persuasion, etc. The design process does not ignore creative effort; on the contrary, it is based in creativity. Finally, materials include any information we utilize in preparing a communication. This, of course, embraces both print and non-print sources--documents, articles, papers, speeches, letters, video-tapes, radio recordings, interviews, etc. The appropriateness of mode can be judged by the honesty with which a writer/designer chooses options in these three areas--tools, processes, and materials. A well-designed communication activity is ethical as well as logical.

Such considerations as logic and ethics motivate the applications of communication. Application does not mean simply "does it work?" It also requires the writer to decide if a given writing design works as it was intended to work. In developing a writing design, the writer must then consider whether or not the selected strategies will achieve the intended results.

Closely allied to application, and perhaps at the core of design, is the concept of telesis. Telesis describes the deliberate, purposeful utilization of processes to obtain a particular goal. In terms of communication, the telesic content must reflect the times and the conditions that give rise to it, and must also be consistent both logically and ethically with the social framework in which it is to function. Telesis, in short, helps writers fit their work into a particular context.

Of course, much of this depends upon not only what the writer wants to convey but what the reader expects to find in a given body of material, the necessities. Rather than wants or desires, the writer's focus during the design process should be on these needs--economic, psychological, spiritual, technological, intellectual, etc. Unfortunately, most writers neglect this area. While it is certainly true that writers often produce a document to explore their own thinking on a particular topic, they should never forget that such efforts are

not communication until someone understands them. The reader as well as the writer is an important aspect of the communication process. The expectations of the reader can indeed be challenging to satisfy; they should be an integral part of the design process.

A genuine hindrance to fulfilling these necessities and to achieving a meaningful design are the reader's associations. Both education and conditioning have an effect upon these associations. Jurgen Ruesch, for instance, points out that:

> Formal education trains people in the use of words and numbers--that is, in verbal communication. Information about codification systems and language used by individuals and groups enables the examiner to predict the way information will be recorded, the limitations and distortions which may occur, the durability of such codifications, the universality or specificity of the statements, and the distribution that these might attain. (177-78)

The reader expects to find certain relationships as well as an ordered identifiable pattern on which he can base his interpretation of a communication. Based on the relative presence or absence of such an informing principle, the reader either accepts or rejects the communication effort.

Finally, aesthetics, a highly overlooked area of communication, is a necessary aspect of the design process. Aesthetics is more than a theory of beauty in art; it is also more than correct, neat typing. In terms of writing, it describes an attitude toward the presentation of communications that makes them sound and read well to elicit the desired reader response. In the composition of music, for instance, the composer knows quite literally that a particular note or movement will produce a certain response in the audience. The same can and should be true of communication. In short, aesthetics can be used to create communication situations that move, please, and are beautiful and meaningful.

The design continuum, along with the concomitant use of analysis and synthesis, can bridge the gap between the technologist as designer and the technologist as writer. The vocabulary for describing the two activities has many points in common. They are, in fact, two ways of describing the same activity--the design process. At the same time, using the design process gives the writer/designer a new perspective on the problems of communication. Perhaps, more than anything else, it demonstrates that there can be a great deal of overlap between the technologists' and the humanists' concerns.

Q. How do you apply this in the classroom?

A. We work hard to demonstrate to the student that there are many points in common between the technological task and the writing task. This focusses on the 'problem solving' aspect of both activities.

Q. Do you do anything else?

A. We emphasize this sense of similarity by imposing serious restrictions on the subject of their term project. It is always aimed at a low technology third world culture. We allow them to use hi-technology in the planning stages--computers, calculus, etc., but the delivered package must be usable by a culture that is just a step above cottage industry. This, of course, focusses a great deal of attention on the social implications of the work from the technological standpoint, and a similar emphasis on the written delivery of the end product--an interest in audience. Oftentimes the final report is written twice, once to the technologist who must deliver the product, and again to the user who lacks technical expertise. I should also mention that a bonus for such an approach is that many students see their work implemented. This tells them two things.

First, someone has understood their writing and responded to it. Second, they see that it is possible to build something else besides highly consumptive products; they realize that there are some people out there who have needs outside the mainstream of the technological society.

Q. This sounds like a really difficult approach to teach. Doesn't it require essentially a separate writing course for each student?

A. Well, I will admit that our loads are inordinately high. There is already an incredible demand for this course as well as other writing courses. The sections range to 30, though this usually looks more like 20 before the end of the quarter. I don't really think that is any different from any other course which requires a final paper. I would rather read 20 different papers than 20 papers on Blake's 'Tyger.'

Q. I imagine that to keep your finger on the pulse of such a course you must have them turn in progress reports. How do you handle that aspect?

A. I don't. At least not in a punitive manner. Tech students tend to be very pragmatic, very results oriented; they use the progress report to let me know what kinds of problems they are encountering. It becomes a dialogue. I might mention that I stole one of Dave Carson's ideas and use a cassette recorder to grade in these classes. It works superbly. The students see it as a conference on each paper; it also becomes a part of that continuing dialogue aspect of the course.

Editor's Note:

Before submitting the following article to Computerworld for publication, Mr. Joseph T. Rigo, President, SYSDOC, Incorporated, sent it to me for inclusion in these proceedings. The article is representative of Mr. Rigo's presentation at the 1978 meeting.

Reader Commentary

Students Good at Writing Have Future With DP

By Joseph T. Rigo
Special to CW

Prof. David Carson has a mission. He wants to make tech writers rich.

Carson is a former air force jet pilot, a retired colonel, who now runs the graduate program in technical writing at Rensselaer Polytechnic Institute (RPI) in Troy, N.Y. Carson has done a number of things to spice up the RPI program, but mainly he is forcing students to get acquainted with computers.

Every graduate student has to take a one-semester computer course that was designed especially for writers. It covers some of the basic concepts. Every student learns to do a few simple programs in PL/I and to design a small function for a text editor.

The RPI program also includes a course in graphics. And, of course, students have to do a great deal of writing.

The net effect is that this year's master's degree graduates are getting job offers from places like IBM and Bell Labs with starting salaries of $18,000 and $19,000. Who says MBAs have all the fun?

RPI also has a doctoral program. Now we may all agree that a Ph.D. in tech writing has got to be a joke, but one of the computer manufacturers will pay $25,000 a year if you have one. Not bad for a kid just out of school.

Two Basic Approaches

Carson talked about it a few weeks ago. The occasion was a meeting at RPI for about two dozen tech writing teachers from colleges around the country.

Carson loaded the agenda with speakers on computer writing topics, and he made his point. By the end of the first day, several of the assembled professors were asking how they could get summer jobs that would help them learn more about data processing.

They indicated that most schools put their tech writing courses in the English department, which is probably as good a place as any. It appears they have two basic approaches to training writers.

One approach emphasizes standard English courses with a lot of technical jargon thrown in. Students turn out an endless stream of papers about business and technical subjects. They are not required to take science courses or to specialize in any one area of interest.

For the most part, these students are trained to be editors. They will work with an engineer. The engineer will write the paper, and the tech writing graduate will review it for spelling, punctuation and grammar.

The second approach exposes students to an assortment of science topics. They go through a series of one-semester courses in biology, physics, chemistry, etc. They learn some of the basic concepts and the technical jargon in each area. The computer course at RPI belongs here.

Again, there is no specialization. A graduate may go into data processing or medical writing or become a science writer for a magazine.

For better or worse, both of these approaches put their emphasis on writing for a general audience. Students do most of their work for the English professor.

The professor may become knowledgeable in several science topics over the years, but he can't be an expert in everything. There is no way that he can know whether a student's description of an I/O command will make sense to an experienced programmer. The situation puts a severe limit on what can be covered in the writing courses.

Meanwhile, over in the university computer center, one or two computer science majors have part-time jobs as librarians or consultants. They document the center's own systems, prepare user guides and help other students solve programming problems.

These students are not part of any tech writing program, but they are getting first-rate experience in writing about technical subjects for a technical audience. Many of them become tech writers.

I would like to see more of the tech writing majors working in the computer center. It would also be nice to have some of the computer center consulants in the tech writing courses.

In either case, I think that writers who are going into data processing should take more computer courses and forget about biology.

John Abbott does not agree. John is publications manager for Data General Corp. He helped RPI develop its computer course, and he was one of the speakers at Dave Carson's meeting. He encouraged the professors to keep their emphasis on tough writing courses. In effect, he said one computer course is enough.

It is possible that John and I are both right. He works for a large company with an ample supply of computer expertise to help train new employees. I work for a small company with minimum facilities for formal training.

That is, a large company needs employees with one kind of background. A small company has a different set of requirements. With luck, the professors will figure out how to keep all of us happy.

Either way, the RPI meeting made it clear that opportunities are good for college students who like computers and who like to write.

Rigo is president of Sysdoc, Inc. in New York City.

Applications of Communication Theory and Cybernetics to Technical Communication

George A. Barnett

Communication Research Laboratory

Department of Language, Literature, and Communication

Rensselaer Polytechnic Institute

Troy, New York

April, 1978

Paper presented at the annual meeting of

The Council for Programs in Technical and Scientific Communication

The author would like to thank David Carson, Craig Harkins and Naomi Kleid who made this paper possible.

Applications of Communication Theory and Cybernteics to Technical Communication

INTRODUCTION:

It is understood that technical documents often do not produce the results hoped for by their authors. This occurs for a variety of reasons. Technical materials change so rapidly that support documents may become obsolete before they are ever disseminated. On the other hand, most failures in technical documentation are probably attributed to human errors specifically associated with appropriate audience analysis. User needs often are not met by the documents, and more questions may be raised by the materials than they may answer. Communication theory in general and cybernetics in specific may provide insights which may help to ameliorate these problems. This paper will present these theoretical notions and show their application the the field of technical communication.

COMMUNICATION THEORY:

Communication may be defined as process whereby information is exchanged between two or more systems existing within an environment or suprasystem. Worth noting are the notions of process, information exchange and environment.

Process

By process, I am refering to the dynamic nature of information exchange. This is to say that the information needs of an ever changing audience changes over time. Conceptually, processes have no beginnings or ends; although, situation specific goals may be defined, the methods of reaching these goals identified and the method carried out such that the goals may be met.

Information Exchange

Information exchange makes explicit the theoretical notion that there is a two way flow of information. Information is not simply transfered from a

source to a receiver, but rather both systems simultaneously perform the functions of information processing, sending new messages based on previously received data and decoding new information.

Environment

The environment simply refers to the specific spacio-temporal reference in which the transaction takes place. Describing the setting helps one to identify the additional factors affecting the interactants' performances and the fidelity of information exchange.

Implications for Technical Communication

What are the implications of these most basic notions of communication? I will suggest three.

*Technical communication must be viewed as a dynamic process. All too often, a scientific article, book or technical document is sent off to the publisher as a finished product, perhaps because of all the effort involved in getting the materials in that form. This notion should be modified to view the technical material as a dynamic, flexible entity, without the permanence generally accured to it.

*Technical documents should be viewed as part of an ongoing exchange of information in which the user has input into the materials' development. They should be designed, produced and altered in part by the user.

*The technical communicator should take into account the context in which the materials will be used. In what organizational setting is the user? What sorts of support materials and people exist? And, where will any new materials fit in? These questions should always be asked before any technical document is planned, written or altered.

I realize that these notions are not earth-shattering and that most tech-

nical communicators will say that they already do all that I have suggested. But these ideas are all too often forgotten. Just try to get a scientific paper published. The editor will demand that it is perfect, a final product, presented in a form ready to be etched into stone. Unfortunately, after the article is in print, the author is stuck with his ideas in the article, as if they were the final word, as we know they were not.

Let us move on to cybernetics...

CYBERNETICS:

Cybernetics has been defined by its founder, Norbert Wiener, as "the science of control and communication".[1] Control is made possible by the process of communicating information between the various components of a system. These components may be individuals, social institutions, or the electrical circuits in a computer. One component, the control center, will transmit information to another, with the goal of producing a desired change in the on-going "behavior" of the latter object. The second component will then transmit information back to the control center, indicating that the information has been received and providing data for the need of additional messages to produce the desired response by that component. The information that is returned to the control center is called feedback.

A Simple Cybernetic System

Walter Buckley distinguishes five necessary stages in the process of control for any cybernetic system. They are:

> 1) A control center establishes certain desired goal parameters and the means by which they may be attained; 2) these goal decisions are transformed by administrative bodies into action outputs, which result in certain effects on the state of the system and its environment; 3) information about these are recorded and fed back to the control center; 4) the latter tests this new state of the system against the desired goal parameters to measure the error or deviation of the initial output response; 5) if the error leaves the system outside the limits set by the goal parameters, corrective output action is taken by the control center.[2]

These stages are linked into a processional order and they may be taken to be the minimum requirements necessary for an operating cybernetic system. This process is graphically displayed below.

FIGURE ONE ABOUT HERE

The cybernetic approach may be applied to the production and dissemination of technical materials. Ideally, writers, editors and publishers of technical materials should act as control centers using information gathered about the users of these materials and their environment to reduce errors in technical documents. These errors may be actual mistakes in the materials or such thing as misperceptions of audience characteristics or their perceptions of the usability of the materials.

The Importance of Audience Analysis

Preliminary to the actual cybernetic analysis is the determination of the population under study. This is known as audience analysis, a process in which one finds out as much as possible about users of the technical materials. Basically we must ask, "Who are they?" The reason why one wants to study the audience is that the probability of perfect communication is zero. However, by proper analysis we can maximize the fedelity of the information exchange.

All communication has less than perfect fidelity. Remember the party game, "telephone", where one person tells another a story and then the first receiver tells another and so on until, after the message has been heard by all, the initial speaker and the final recipient of the message compare stories. Everyone laughs because the two versions are so different. What has happened is that the fidelity of each exchange has been less than one. When multiplied by all the other exchanges which are also less than one, the final accuracy approaches zero.[3]

One reason communication is never perfect is that the individuals involved in the communication process always come from somewhat different backgrounds. Hence, they bring a somewhat different set of past experiences, attitudes, knowledge and values to the communication event. This effects the perception and interpretation of the information received. Thus each individual gives the communication an unique interpretation.

In communication theory, it is generally recognized that the more similar two individuals are, the greater the probability for accurate transfer of information. In the language of communication researchers this notion is known as the homophily-heterophily distinction.[4] Accurate communication is always easiest if two individuals are very homophilous with regard to the attributes or characteristics most relevant to the topic under discussion. Thus, one way to maximize the fidelity of the information transfer in technical documents is to have individuals with backrounds very similar to the actual users produce the materials. This is often not possible simply because the person who has the information is different from the person who does not. An alternative is to determine who the audience is and to orient the information to their needs in terms of their particular backrounds.

Thus, the first step in the audience analysis is to distinguish among the intended, the actual and the potential audiences for the material. One would want to survey all three groups because each will provide important information necessary to produce the maximally effective document. With the initial audience analysis completed, the cybernetic analysis can begin.

Set the Goal Parameter

The first step in a cybernetic analysis is to set the goal parameters. Why are the materials being written? What goal(s) are they designed to meet?

Before any actual writing takes place one should answer the following questions: What materials, if any, are currently being used which may meet the stated goal of the planned technical document? Is a new document in this area really necessary? Assuming that the new materials are necessary, use the audience analysis of the potential audience to determine its level of expertise, what materials it is currently using, and what it would like to see in a new document.

The next step is to write a draft of the material and survey the intended audience to determine their reactions to the draft or prepublication copy of the materials. The editors should use these preliminary evaluations to make adjustments in the text before dissemination. This information will be useful to writers, planners and editors of technical materials. In cases where the materials are commercial endeavors such as textbooks this information will prove useful to marketing and sales personel.

We may consider everything to this point precybernetic because the actual materials have not yet been disseminated. That is, the document (action output) has not left the control center to the environment in which it will be used. As a result, our ability to predict the need for future corrective action is limited. In a certain sense only the goal parameter has been defined and the mechanism to reach the goal created.

Communication by the Control Center

The next stage in the cybernetic analysis is for the control center to exert influence on the other components of the system in an attempt to achieve the goal parameter. This is always done by the exchange of information. In this case, the exchange takes place through technical materials. Thus, the specific behaviors performed during this stage are publishing the document and distributing it to the intended audience,

Note that a discrepancy may develop because the actual audience and the intended audience may not be the same. These may differ in backround, knowledge, skills, their familiarity with the material format or information needs. Even if there is no discrepancy between the actual and the intended audience, one might miscalculate the users' needs, desires or skills. Because of the long lead time common in publishing, these needs or skills may change so rapidly that the technical document is outdated.

Using Feedback After it is Published

During this stage in the analysis, information is gathered by the control center about the effects of the output on the system, i.e., how effective the document was in meeting the established goals. There are a number of ways to gather this information. However, in this paper I will concentrate on survey methods. Ideally, one wants to survey the actual users of the materials to measure the discrepancy between the desired goal that the document was intended to meet and its level of achievement. This raises a basic question, how do we know who the actual users are?

There are a number of ways to gather this information. Cards may be placed in the document which may be mailed back by the user. These cards may ask the actual user to nominate other users. These "snowball techniques" may be used to generate a sample from any known group of users. Book orders or sales records may be used to determine actual users. These may come from individual, academic or private organizations. For example, every computer company knows who purchases or leases their machines. They could with minimum difficulty ask their clients some questions about the machine's support documentation. Additionally, accessing records from libraries or computer based information systems may be used to determine the actual users of the technical materials.

These methods have been suggested rather than any form of random sampling because they get at the actual users and thus improve the quality of feedback.

For widely disseminated technical materials one might wish to use some more traditional stratified random sample. The sample of potential users could be stratified according to known demographic characteristics so that the numbers in each group would equal their proportion in the population. One might parcel the sample by such variables as age, sex, income education, occupation, role in an organization (job classification) or known languages, either human or computer.

Some of the questions one could ask are:

* The frequency of reliance on technical materials.
* The specific document's effectiveness at meeting users needs.
* Were the user's expected needs and desires met by the document?
* Frequency of the document's use and resultant solution to the problem for which it was consulted.
* Frequency of going to other materials. Which ones?
* What additional information should the document contain?
* Specific other sources used--documents and people.
* Feedback on specific sections of the document.
* Open-ended comments. Unanticipated feedback.
* Demographic characteristics of users.
* Who else uses the materials? General and specific individuals.

Comparator Test by the Control Center

In this stage of the cybernetic analysis a comparator test is performed by the control center in which the value of each of the variables described

above is compared with the desired goal. This results in an error signal. Thus, one evaluates the feedback about the document. This data can be used for future editions or updated versions of the document.

Corrective Action by the Control Center

If the document's degree of discrepancy from the goal state is significant, a corrective action should be taken by the control center. This could be in terms of future editions, updated materials or revised sections of more flexible documents. An example where this should take place is government publications some which change over time as laws and regulations change. Computer manuals or program documentation, scientific textbooks and technical catalogs also need frequent updating.

The decision to update should be a function of such factors as the amount of discrepancy or error, the frequency of mistakes, the clustering of these mistakes, the obsolence rate and cost. In the case where no immediate corrective action is necessary, these variables should also be used to determine the frequency at which additional feedback is gathered. At these future points a corrective action may be necessary.

So, application of cybernetics to technical communication requires

* the setting of goal parameters
* transmitting communication from the control center to produce the goal state
* receiving feedback at the control center to measure transmitting distortion
* conducting the comparator test at the control center, and finally
* transmitting corrective action from the control center.

IMPLICATIONS:

If a cybernetic approach to technical documentation is adopted, I see the following possible changes in the field of technical communication. Technical materials will become modifiable, flexible and modular for easier modification since all must be designed for easy, frequent, periodic updating. Unanticipated new editions should be announced so that the critical identified users are notified in sufficient time. The document should be produced on cheap paper so as to discourage its permanance. Most technical communication will be stored primarily on computer based information systems. In this way, corrections of errors can be facilitated and resultant behavioral errors reduced.

Also, I see the role of the technical writer and editor changing. They must be trained in audience analysis. They must develop a more active relationship with the users of their documents and adopt the attitude that each document is temporary. They must become less ego-involved with their work and they must come to view their work as part of a continual process of keeping their audiences informed.

Publishing houses and large scale producers of technical documents may get directly involved in the evaluation of technical materials by soliciting feedback from users. This research group will not be a replacement for those involved in the creative process of technical communication, but will assist these editors and writers. In this way, they will be able to perform their task more effectively.

While it would cost a great deal to set up a whole survey research group, an individual survey may be performed for as little as $100. On the other hand it could cost as much as $100,000 depending on the audience, depth of the survey and the frequency of measures over time. To minimize the cost to

the organization which produces the technical materials, these may be performed by private survey research firms.

The cost of this research is minimal when compared to the cost effectiveness for a company which uses erroneous or ineffective technical documentation. It would cost a company a great deal more if no one read the produced materials. There could be less errors in catalog sales. Products could reach their intended markets and processes within the organization could perform more efficiently when the users of these materials get the accurate information necessary to perform their jobs. Thus, accurate technical materials can pay for the necessary research.

SUMMARY

In summary, this paper has, however broadly, suggested the application and implications of communication theory in general and cybernetics in specific to technical communication.

1. Wiener, N. Cybernetics, Cambridge: MIT press, 1961.

2. Buckley, W. Sociology and Modern Systems Theory, Englewood Cliffs, N.J.: Prentice-Hall, 1967, pp. 173-174.

3. The appropriate equations to describe this process may be written as follows:

$$H_n = (h_{1,2})(h_{2,3})(h_{3,4})\ldots(h_{n-1,n})$$

where,

H_n = the final fidelity

$h_{i,j}$ = the fidelity for a single information exchange

$h_{i,j} < 1.0$

n = the number of people or information exchanges

or, if we assume an equal fidelity for all $h_{i,j}$ then,

$$H_n = \lambda^n(Ho)$$

where

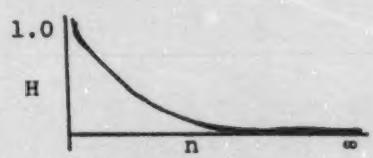
$H_o = 1.0$

$\lambda = 1 - \alpha, < 1.0$

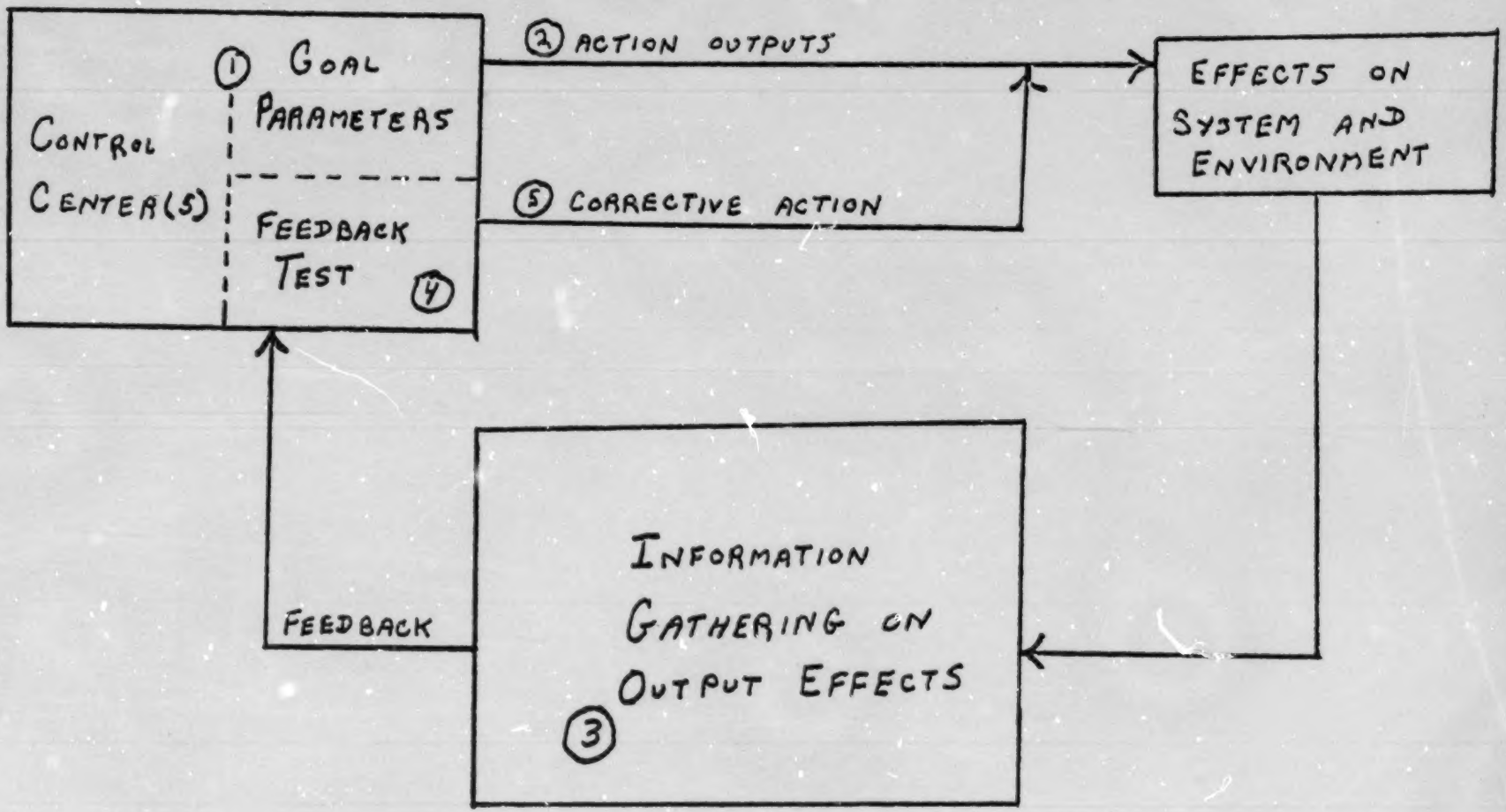
α = dH/dt or the slope of the fidelity (H) over time

$\therefore$ = $H \to 0$ as $n \to \infty$

Graphically, this series of equations may be displayed as follows.



4. Rogers, E.M. with F.F. Shoemaker Communication of Innovations, New York: The Free Press, 1971.



From: Buckley, W.
Sociology & Modern Systems Theory
1967

General Reading List on Communication Theory

Berelson, B., Lazarsfeld, P. & McPhee, W., Voting: A study of opinion formation in a presidential campaign. Chicago: University of Chicago, 1954.

Berlo, D.K., The process of communication. New York: Holt, Rinehart and Winston, 1960.

Buckley, Walter, Sociology and modern systems theory. Englewood Cliffs, New Jersey: Printice-Hall, 1967.

Farace, R.V., Monge, P.R. & Russell, H.M. Communicating and organizing, Reading, Mass.: Addison-Wesley, 1977.

Goffman, E., The presentation of self in everyday life, Garden City, New York: Anchor Doubleday, 1959.

Heider, F., The psychology of interpersonal relations. New York: Wiley, 1958.

Homans. G., The Human group. New York: Harcourt, Brace & World.

Knapp, M.L., Nonverbal communication in human interaction, New York: Holt, 1972.

Lazarsfeld, P., Berelson & Gaudet, H., The peoples' choice. New York: Columbia University, 1948.

McLuhan, H.M., Understanding media; the extentions of man. New York: McGraw Hill, 1964.

Mead, G.H., Mind, self and society, Chicago: University of Chicago, 1934.

Miller, G.R. & Steinberg, M., Between people: a new analysis of interpersonal communication. Chicago: Science Research Associates, 1975.

Mortensen, C.D. Communication: the study of human interaction. New York: McGraw-Hill, 1972.

Mortensen, C.D. & Sereno, K.K. (eds), Foundations of communication theory. New York: Harper & Row, 1970.

Newcomb, T.M. The aquaintance process. New York: Holt, Rinehart and Winston, 1961.

Osgood, C.E., Suci, G.J., Tannenbaum, P.H., The measurement of meaning. Urbana: University of Illinois, 1957.

Pool I., Frey, F., Schramm, W., Maccoby, N., & Parker, E. (Eds.), Handbook of communication. Chicago: Rand McNally, 1973.

Rogers, E.M. with Shoemaker, F.F. Communication of innovations: a cross cultural approach. New York: Free Press, 1971.

Rogers, E.M. & Agarwala-Rogers, R., Communication in organizations. New York: Free Press, 1976.

Rubin, B.D. (ed.), Communication Yearbook I, & II, New Brunswick, New Jersey: Transaction Books, 1977, 1978.

Sapir, E. Language, New York: Harcourt, Brace and World, 1921.

Shannon, C. and Weaver, W., The mathematical theory of communication. Urbana: University of Illinois, 1949.

Shaw, M.E., Group dynamics: the psychology of small group behavior. New York: McGraw-Hill, 1976.

Smith, A.G. (Ed.), Communication and Culture. New York: Holt, Rinehart and Winston, 1966.

Weiner, N. Cybernetics. Cambridge, Mass: MIT Press, 1961.

Whorf, B.L. Language, Thought and Reality; selected writings of Benjamin Lee Whorf. J.B. Carroll (ed.), New York: Wiley, 1956.

The following journals are suggested for further study of communication theory.

Communication Monographs
Communication Research
Human Communication Research
Journalism Quarterly
Journal of Communication
Philosophy of Rhetoric
Quarterly Journal of Speech
Sociometry
Journal of Personality and Social Psychology

General Reading List on Communication Theory

Berelson, B., Lazarsfeld, P. & McPhee, W., Voting: A study of opinion formation in a presidential campaign. Chicago: University of Chicago, 1954.

Berlo, D.K., The process of communication. New York: Holt, Rinehart and Winston, 1960.

Buckley, Walter, Sociology and modern systems theory. Englewood Cliffs, New Jersey: Printice-Hall, 1967.

Farace, R.V., Monge, P.R. & Russell, H.M. Communicating and organizing, Reading, Mass.: Addison-Wesley, 1977.

Goffman, E., The presentation of self in everyday life, Garden City, New York: Anchor Doubleday, 1959.

Heider, F., The psychology of interpersonal relations. New York: Wiley, 1958.

Homans. G., The Human group. New York: Harcourt, Brace & World.

Knapp, M.L., Nonverbal communication in human interaction, New York: Holt, 1972.

Lazarsfeld, P., Berelson & Gaudet, H., The peoples' choice. New York: Columbia University, 1948.

McLuhan, H.M., Understanding media; the extentions of man. New York: McGraw Hill, 1964.

Mead, G.H., Mind, self and society, Chicago: University of Chicago, 1934.

Miller, G.R. & Steinberg, M., Between people: a new analysis of interpersonal communication. Chicago: Science Research Associates, 1975.

Mortensen, C.D. Communication: the study of human interaction. New York: McGraw-Hill, 1972.

Mortensen, C.D. & Sereno, K.K. (eds), Foundations of communication theory. New York: Harper & Row, 1970.

Newcomb, T.M. The aquaintance process. New York: Holt, Rinehart and Winston, 1961.

Osgood, C.E., Suci, G.J., Tannenbaum, P.H., The measurement of meaning. Urbana: University of Illinois, 1957.

Pool I., Frey, F., Schramm, W., Maccoby, N., & Parker, E. (Eds.), Handbook of communication. Chicago: Rand McNally, 1973.

Rogers, E.M. with Shoemaker, F.F. Communication of innovations: a cross cultural approach. New York: Free Press, 1971.

Rogers, E.M. & Agarwala-Rogers, R., Communication in organizations. New York: Free Press, 1976.

Rubin, B.D. (ed.), Communication Yearbook I, & II, New Brunswick, New Jersey: Transaction Books, 1977, 1978.

Sapir, E. Language, New York: Harcourt, Brace and World, 1921.

Shannon, C. and Weaver, W., The mathematical theory of communication. Urbana: University of Illinois, 1949.

Shaw, M.E., Group dynamics: the psychology of small group behavior. New York: McGraw-Hill, 1976.

Smith, A.G. (Ed.), Communication and Culture. New York: Holt, Rinehart and Winston, 1966.

Weiner, N. Cybernetics. Cambridge, Mass: MIT Press, 1961.

Whorf, B.L. Language, Thought and Reality; selected writings of Benjamin Lee Whorf. J.B. Carroll (ed.), New York: Wiley, 1956.

The following journals are suggested for further study of communication theory.

Communication Monographs
Communication Research
Human Communication Research
Journalism Quarterly
Journal of Communication
Philosophy of Rhetoric
Quarterly Journal of Speech
Sociometry
Journal of Personality and Social Psychology

THE UNDERGRADUATE ENGLISH MAJOR WITH AN EMPHASIS IN TECHNICAL WRITING

Paul V. Anderson
Miami University
Oxford, Ohio

Since 1953, when RPI inaugurated its graduate program in technical communication, a wide variety of such programs has sprung up around the country at both the undergraduate and graduate levels. Today, I would like you to give special consideration to one particular group of these programs: the programs that are essentially undergraduate English majors with an emphasis in technical writing. I ask you to consider these programs, which I will call "emphasis programs," for two reasons:

- Emphasis programs are significantly different from the programs administered by most of you.

- The Council should decide, I believe, what attitude it wants to take toward these programs.

I feel particularly qualified to describe emphasis programs to you because my department at Miami University has just voted to institute one in the autumn. Our program is described in Table 1. Because our program is typical of the species, let me explain its major features.

Typical Emphasis Program

Overall, Miami's program consists of two kinds of courses. First, there are eleven courses given by the English department. The purpose of these courses is to teach students how to write well, both by having the students practice their own writing skills and by having them read good writing by others. Second, there are four advanced courses given by other departments. These courses have two purposes. One of the four is designed to give students some additional work in communications, although not in writing. Thus, students may take one from a long list of courses offered by such departments as Communication and Theater, Educational Media, Philosophy, and Art. The remaining three extradepartmental courses are designed to give students a thorough introduction to some professional area, such as systems analysis, chemistry, geology, or psychology. By taking these latter three courses (and their prerequisites), students will learn enough about some professional area so that once area so that once they graduate they will be able to grasp quickly the particular concepts in that area that are of interest to their employers.

Distinctive Features

I began by saying that this program and the others like it are different from the programs that most of you administer. Four differences are particularly important:

1. More General In Their Objectives. Most of you administer programs designed to prepare students for one particular kind of job: a job that requires considerable sophistication in engineering or science and even in the use of computers to manage information and edit material. In contrast, emphasis programs are likely to prepare students for any of a broad range of careers. For instance, students in Miami's program can prepare for careers in advertising, public relations, or industrial journalism, as well as in technical writing. Furthermore, some of the Miami students who want to work in technical writing will not be preparing for the highly specialized jobs that almost all of your students want. Instead, these Miami students desire to work in the many technical writing jobs that do not require either so profound a knowldege of science and engineering or so close an acquaintance with computers.

2. Fewer Specialized Courses. English departments will, in general, build their emphasis programs on the existing strengths of the departments. Departments like Miami's that house their own journalism programs, for instance, will build technical writing programs that use existing journalism courses. Likewise, those that have substantial offerings in linguistics will emphasize linguistics, and those with substantial offerings in rhetoric will emphasize rhetoric. In most departments, therefore, the number of new courses designed specifically for the technical writing student is likely to be fairly small, partly because the departments cannot hire people qualified to teach specialized courses in technical writing and partly because the departments are confident that students can prepare adequately for a wide variety of jobs by taking a carefully selected group of courses that the departments already offer.

3. More Literature Courses. Your programs, generally, include no literature courses beyond those required of all students in your schools. In contrast, English departments are likely to require a considerable number of literature courses in their emphasis programs. The departments will require literature courses because they believe that one good way to teach students to write well is to have the students read good writing--and because teaching literature is an activity that all English departments consider to be one of their strengths. In

Miami's program, for instance, five of the eleven courses required within the department are literature courses.

4. Fewer Courses Outside English. In the programs that most of you administer, students must take a substantial number of courses outside the English department, enough in some cases to amount to a minor or even a second major. In emphasis programs, however, the extradepartmental requirement will usually be very small. Miami's program, for example, requires only four courses outside the English department (not counting prerequisites). Of course, fewer requirements mean more electives. Students who wish to take a double major can easily do so at Miami; at the same time students are also free to prepare themselves for the many jobs in writing--even in technical writing--for which a liberal education is the best preparation.

As you can see, emphasis programs are quite different from the programs that most of you administer. What should be your attitude toward this difference? On the one hand, you may want to establish a hierarchy among technical writing programs in which programs like your own (that is, the highly specialized) occupy the pinnacle. In such an order, emphasis programs would come very low indeed. On the other hand, you may decide to view a wide variety of technical writing programs as a reasonable reflection of the wide variety of technical writing positions that students might eventually fill. After all, the amount of specialized knowledge required of technical writers varies greatly from job to job.

Assistance Needed

The proper attitude toward emphasis programs is, however, a matter that I will leave for you to discuss later. Right now, I would like to describe some ways in which the Council could, if it wished, help those members of English departments who would like to start emphasis programs. I am thinking of two kinds of assistance in particular:

- Helping them design sound, successful programs.
- Helping them win approval for their programs from their departments.

Designing Programs

To design sound, successful programs, faculty need to know what such programs look like. They need models, and they need guidelines that will enable them to see how to adapt those models to their own departments. Descriptions of some possible models are already being provided by the Council, which has published a

directory that describes sixteen established programs in technical and scientific communication.

As helpful as that directory is, however, it does not provide all the information that English faculty need. In addition, English faculty need information that will help them use the material provided in the directory. Without some explanation of the various kinds and qualities of programs described in the directory, English faculty will encounter problems when trying to evaluate the programs they are reading about, and they will find it difficult to choose wisely when trying to select the particular models upon which to base their own programs.

Furthermore, there are some important features of a good program that do not appear in the Council's directory at all. For example, the directory does not indicate how very crucial it is that at least one faculty member in each program know how to find jobs in technical communication for students. Such an adviser is especially important because the channels usually used by graduating seniors to find jobs--like the campus placement center and the want ads--are not reliable means of locating positions in technical writing. In most cases, students in technical writing need the assistance of an adviser who has numerous contacts with employers and who knows how to make even more contacts if the need arises.

There are at least two ways the Council can provide the information that faculty need in order to design sound programs. First, the Council can issue a new edition of its directory; this edition could supplement the information contained in the present edition with the additional kinds of material I have just described. Second, the Council can arrange a national conference on designing technical communication programs. Such a conference could, I suspect, be financed by a grant from the National Science Foundation or some similar federal agency.

Winning Approval

In many English departments, program design is the easiest step in establishing emphasis programs in technical writing. The more difficult task is to win approval for the programs from the departments. Before they approve such programs, English departments want to be assured of three things: that the programs are sound, that they will attract students, and that they will not alter the nature of the departments in an undesirable way.

The Council can do two things to help faculty persuade their departments that their programs are sound. First, it can issue the publication or sponsor the conference I mentioned a moment ago. If English faculty can say that they used such resources when designing their programs, they will be better able to persuade their colleagues that the proposed emphasis programs are soundly designed.

The Council can also suggest that the faculty begin to train students in their programs informally, before the programs win official approval. In most English departments, there are already some students who would be interested in preparing for careers in technical writing if they knew that those careers existed and if they knew how to prepare for them. If interested faculty members can find those students, they can advise the students to take the courses that will eventually comprise the emphasis program, supplying the students with missing coursework through independent study if necessary. At Miami, we graudated five eminently employable students in this way before we even proposed our program to the English department. As a result, we had powerful evidence that our program was sound enough to produce graduates who could obtain very attractive jobs.

Besides wanting to be assured of the soundness of an emphasis program, many departments will want evidence that such a program can attract students. By collecting and sharing enrollment data from existing programs, the Council can help faculty show that emphasis programs do increase enrollments. It can also point out that faculty who begin training students informally before proposing a program to their departments will be able to prove beyond any doubt that students at their own schools will enroll in an emphasis program, once one is established.

However, some departments will continue to look skeptically at emphasis programs even after the programs' soundness and ability to attract students have been incontrovertibly demonstrated. These departments fear that in some way emphasis programs threaten the very nature of an English department. One reason is that, traditionally, English departments have devoted themselves so singlemindedly to developing the humanistic capacities of their students that the departments have eschewed efforts to help their students develop skills that would make the students employable in any profession other than teaching. To these departments, a program designed to prepare students for a non-teaching career may seem antithetical to what they see as the traditional--and proper--mission of an English department. A second reason has to do with enrollments in literature courses, the courses most English departments consider to be the heart of their offerings. Partly as a result of their distaste for concerning themselves with the employment of their students, most English departments have suffered severe declines in enrollment in their literature courses over the past several years. They have lost literature majors, and they have lost the interest of many of the students in other majors who had previously taken literature courses as electives. One consequence of an emphasis in technical writing could be that some of the students currently majoring in English literature would be drawn to the emphasis and therefore would enroll in more writing courses and fewer literature courses.

Because many English faculty are likely to fear that emphasis programs in technical writing will alter the very nature of their departments, faculty who have emphasis programs to propose must do

so in a way that will placate rather that exacerbate any hostility that their colleagues may feel. Unfortunately, many of the faculty who design emphasis programs will be strongly tempted to present their programs in a way that would offend other members of their departments. Many of them have been teaching writing for a long time. During the years when literature courses flourished, these faculty were often saddled with greater teaching loads and recompensed with smaller salaries than were their colleagues who taught literature. Now that their colleagues are showing a new interest in writing, because of the enrollments that writing courses can attract, these teachers will be greatly tempted to point out the irony of the situation--and perhaps to exaggerate both the indignities they have suffered and the extent of the relief they can bring to their departments. I am sure that many members of the council can empathize with these writing teachers in their moment of temptation, because I have heard some of you make the very kinds of remarks that I am talking about. However, these writing teachers will have to overcome the temptation if they are to win approval for emphasis programs.

The Council can help writing teachers overcome this temptation if it sets a good example by overcoming the temptation itself. If its advice is to be truly useful, the Council must not make English departments feel that they would be moving in a radically new direction by establishing emphasis programs, even though the Council may be fully aware that in earlier days these same departments would have scorned the advice they are now seeking. The Council must recognize that from one point of view emphasis programs are a perfectly reasonable way for English departments to pursue such traditional goals as enabling students to communicate their intellectual concerns effectively. Certainly, the Council must not criticize the departments' traditional goals (which are, after all, not only legitimate but also admirable), and the Council must not insist upon reminding English departments that an exclusive interest in pursuing humanistic goals may hurt enrollments in periods when students think more about getting jobs than about developing their humanistic capacities.

Conclusion

There is, then, a great deal that the Council can do to help faculty who would like to institute emphasis programs in technical writing. It can expand the directory that describes existing programs, and it can sponsor a conference on designing emphasis programs. Such projects will help interested faculty design successful programs. Furthermore, being able to say that they have consulted the directory or attended such a conference will help faculty win approval for the programs. The Council can also help the faculty win approval by gathering and sharing enrollment data and by helping the faculty propose their programs in ways least likely to arouse antagonism among their colleagues.

Although there is a great deal that the Council can do, the Council must first address the question of whether it wants to do anything at all. My feeling about the answer should be obvious. While helping to design the emphasis program for my own English department, I have benefited from the advice generously given by several of you, and I believe that faculty at other schools would also benefit from this kind of advice, advice that could be provided more efficiently through the Council than through individuals. However, the Council may decide that it does not want to provide this advice; it may decide that it does not want to do anything that will encourage the proliferation of emphasis programs, perhaps because the Council views these programs as nothing more than feeble imitations of the specialized programs that most of you administer. On the other hand, the Council may decide that emphasis programs are appropriate companions to the more specialized programs. In that case the Council will probably want to ensure that emphasis programs are as soundly designed and run as possible. One consequence of your encouragement, of course, will be that faculty from emphasis programs will begin to join the Council. Thus the decision you make will not only influence the quality of the emphasis programs that are instituted in the coming years, but it will also determine the character of the Council itself.

Table 1

WRITING FOR BUSINESS, INDUSTRY, AND GOVERNMENT

Department of English
Miami University

This major is intended for students who plan to: (a) receive a terminal AB in English and pursue a career in writing and editing for business, industry, or government or (b) prepare for graduate work in science journalism or technical communication. For descriptions of the courses, consult the University Catalog.

DEPARTMENTAL UNIT:	HOURS:
I. A survey of English (131, 132) or American literature (141, 142).	6
II. Three additional courses in English or American Literature, two of which must be advanced (i.e., numbered 200 or higher). To be selected from those literature courses which count towards the English major (i.e., not ENG 210, 220, 230, 262, 293, or 423). Consult the Catalog.	9-12
III. Four core courses:	
211 News Writing and Reporting	3
215 Technical Writing	2
315 Business Writing	2
415 Advanced Technical Writing	3
IV. Two additional courses selected from this list:	6-9
218 Copy Editing and Make-up	
225 Advanced Composition	
226 Creative Writing	
302 Structure of Modern English	
311 Legal Writing	
316 Reports and Evaluations	
318 Feature Writing	
340 Internship (6 hours or more)	
	31-37

EXTRADEPARTMENTAL UNIT:

Students must complete four courses in related areas, including one advanced communication course taught outside the Department of English and three advanced courses in some professional area other than communication.

I. Communication Course. To strengthen their ability to communicate, students must take one of the following courses:

ART 251 Lettering and Graphic Communication
CAT 331 Speech Composition
357 Radio Writing
358 Television Writing
359 Introduction to Public Relations
433 Contemporary Theories of Communication

Table 1 (continued)

EDM 443	Audio-Visual Instruction Methods, Media and Technology
EGR 143	Graphical Analysis
IED 141	Introduction to Graphic Arts
151	Drafting and Design
241	Photography
351	Technical Illustration
MGT 321	Organizational Behavior
MKT 441	Advertising
442	Advertising Practice
OAD 321	Automation and Mechanization of Office Procedures
PHL 263	Informal Logic
273	Formal Logic
497	Philosophy of Language
PSY 466	Psychology of Language and Thought
SOC 215	Communication and Society I
SAN 151	Introduction to Computers

II. Professional Area Courses. To prepare to use their communication skills in some specific professional area, students must take the courses described in one of the options described below. Whichever option is selected, the specific courses chosen must be approved by the adviser for the Type VII major.

Option A. Three advanced courses all taken in the same department from the School of Business or from the natural, social, or applied sciences.

Option B. Three advanced courses selected from a variety of departments, provided that all the courses relate to a single profession and that the group of three courses is approved by the adviser.

Option C. Three advanced courses in Environmental Sciences, including

GEO 271	Conservation of Natural Resources
IES 431	Introduction to Environmental Science

and one of the following:

AER 251	Meteorology
BOT 335	Introduction to Plant Ecology
GEO 466	Geography of Energy Resources
472	Geography of Population and Resources
PPS 432	Water and Air Analysis Laboratory
PHY 321	Environmental Physics
ATH 371	Ecological Anthropology
ZOO 332	Fundamentals of Ecology

Wayne Losano
English Department
University of Florida
Gainesville, Florida

AN INTERDISCIPLINARY COURSE IN TECHNICAL WRITING

As it turns out, the title I have been assigned is something of a misnomer, and my presentation will most likely parallel Paul Anderson's on building a technical communication program within a traditional English Department. As the Council's recent directory of technical and scientific communication programs shows, most of the existing technical writing programs are actually interdisciplinary (note particularly the description of Michigan Technological Institute's program).

The University of Florida does have a formalized interdisciplinary program which grants a degree in interdisciplinary studies, and requires a 36-quarter hour specialization of related courses taken in two or more departments. This program is administered by a university committee which may approve or reject proposed student programs. Within the interdisciplinary program I have helped students design studies in 'Marketing Communication' (Business Communication and Marketing courses) and 'Environmental Writing' (Technical Communication and Environmental Science courses). I find some problems with such efforts--a certain lack of definition and an excess of administrative redtape, plus some slight difficulty with possible employers. Interdisciplinary programs such as those many of us offer in technical communication seem more workable since they are based in one department and more easily monitored. For my own purposes, I find that the interdisciplinary possibilities of a technical communication program based on a standard English program are quite sufficient to turn out students competitive in the field of technical communication.

Since we do not have an actual program in technical communication, at least none described in any catalog, there are fewer recruitment and placement pressures, which is pleasant. Since we have no definitely established program, we are able to exert more direct advisory control on the students interested in a career in professional communication. Since our students must take the basic English major curriculum, they tend to have a certain group of skills and a usefully developed critical approach, which will later be useful. Finally, since our department is still a traditional English department, and thus faced with its own enrolment and placement problems, there is a great deal of support available for a specialization in professional communication. All in all, I am not eager to see us formalize a program in technical writing. It would seem that effective advising, the availability of a wide variety of courses, and the right sort of resume are sufficient. Of course, there are problems. Employers in the Southeast do not know what we have available, so students will have to sell themselves more than will students in a more visible program, and our students will not be eligible for the STC scholarships.

Track Outline

The requirements for an undergraduate English major at the University of Florida are simple enough--one course in literature before 1800; one course in literary theory, criticism, or genres; and one course in the study of language or the

practice of writing. For students interested in professional communication we suggest a concentration of departmental courses such as Advanced Exposition, English Grammar, Basic Technical Writing, Business Communication, Report Writing, and Speech Writing. We plan to add rotating topics courses such as Proposal Preparation, Writing for Publication, Biomedical Writing, and Popular Science Writing if there is student demand. Thus far, the few students following this track have continued to take a block of literature hours, and we would encourage this for a variety of reasons.

Undergraduates at the University of Florida are required to take 45 quarter hours of upper-division electives outside of their major. English majors emphasizing professional communication take Editing and Graphics from the Public Relations Department and may select from such courses as Magazine and Feature Writing, Advanced Graphics and Production, Copywriting and Visualization, and Writing Mass Communication. The Art Department offers Photography, Layout, Typographical Design, and such. There is no special computer course for our people, but students have taken Introduction to Computer Programming, Introduction to COBOL Programming, and Introduction to Computer Organization; there are fifty-five other computer courses offered by the Department of Computer and Information Sciences.

I am not certain whether potential technical writers need an in-depth concentration in some particular area of science or technology or a broad overview of a variety of fields. The first is the truly interdisciplinary approach, and one of my students does have a minor in Chemistry. The second is more attractive to traditional English majors and provides at least the jargon and general concepts of various areas. The University of Florida offers many introductory courses--Introduction to Medical Technology, Principles of Entomology, Concepts of Environmental Engineering Sciences, etc.--which an English major can handle with reasonable comfort.

Conclusions

I can fully appreciate the joys of running one's own program in technical writing, particularly a program which enjoys some national reputation or even a regional one, but I am not unhappy with what we offer in the English Department at the University of Florida. Staffing limitations, budget restraints, and tremendous pressures on us to offer service courses in business and technical writing necessarily restrict our expansion efforts. The area is also limited in industrial development, so we do not have to turn out very many trained technical writers. However, as more positions become available, and we expect they will, and as more English majors realize the possibilities within industry, we will be in a position to provide at least the basic coursework essential to a professional communicator.

THE TEACHING OF TECHNICAL COMMUNICATION IN AUSTRALIA

Thomas C. Dixon, Ph.D.

Senior Lecturer in Communication

Queensland Institute of Technology

Brisbane, Australia.

We can look at the teaching of technical writing from three perspectives, the teaching of teachers, the teaching of professionals, and the teaching of on-the-job users.

In the U.S.A. there is a wide diversity of approach in each of these three areas, and standards very from minimal to excellent. The same diversity exists in Australia, but on an abbreviated scale, abbreviated by the fact that we lack your institutions of excellence.

The Teaching of Teachers

Let me illustrate this generalization by discussing first the teaching of teachers.

Here Australia suffers because we lack institutions where the study of communication has been developed to excellence, like R.P.I. At present we are engaged in a "boot-strap" operation. We have no base where technical communication in Australia is studied, and the results of this study codified and made available to practitioners and teachers.

We have several sources of teachers. First, we find them in the traditional disciplines, English and sociology or social psychology, and then ask them to train themselves using American textbooks. Of course, this means that for several years teachers are just ahead of their students in preparation, and for several more years they face a problem of converting foreign illustrations to the Australian context so that students see the subject matter more clearly as relevant to their later careers.

This method is supplemented by study leave release of teachers to work in industry. Teachers are paid by their university during this period of release, which can vary from one month to one year. Unfortunately, there have been few positive results from this approach. There tends to be more

return to the individual in terms of consulting than to the university in terms of scholarship. Another reason for lack of results is the fact that most people who are recruited to teach technical communication, for example, myself, do not (or did not) have Ph.D.'s, and consequently they use their leave to further their formal qualification rather than for study and formalization of professional practice.

Another much smaller source of teachers is adequately trained and educated professional communicators who wish to teach. This source is much smaller because there are very few people practising technical communication in Australia at present who have formal education in English language. Most are scientists and engineers who have engaged in communication as part of their job, found that they like it, and converted.

Again I will illustrate with an instance from Q.I.T. Our only member of staff with this background worked with C.S.I.R.O. (the Commonwealth Scientific and Industrial Research Organization) as a technician, and gradually found himself devoting more and more, and then all of his time to writing. He then completed a B.S. degree at Canberra College of Advanced Education, half of which was in biology, the other half in professional writing. We appointed him to our staff as a lecturer, grade 1 (equivalent to an assistant professor) shortly after he graduated. We regarded his practical experience, which varied from the preparation of annual reports to the production of films about C.S.I.R.O. activities, as being of value equal to a higher degree.

A problem with this source of recruiting, again, is that initial formal qualifications are low, so that study leave and all spare moments must be used to remedy this deficiency rather than in more productive interaction with the scientific, industrial, and business community.

However, we are gradually hauling ourselves up and I look forward to a time when our teachers are contributing to the professional community in the way that I have seen here in the U.S.A.

The Teaching of Professionals

A professional technical communicator is a person who earns the major part of his/her income by engaging in technical communication. Pretraining programs would include baccalaureate and masters degrees with major concentrations in the theory and practice of technical communication. A very clear example is the masters program at R.P.I.

There are no such programs in Australia. We do have one or two programs that can be converted to this use by some dint of student effort. One is the course in professional writing at Canberra C.A.E. which I have already mentioned. This program was designed for people who intend to work as journalists, feature writers, or script writers, but can be changed to suit the technical communicator by some negotiation on assignments with

individual lecturers.

The lack of programs to educate professionals in technical communication results from the comparative immaturity of our technology, much of which we import. Technical communication, in these circumstances, reduces to adaptation of overseas material to suit local conditions. However, as our economy develops, the lack of programs in technical communication will come to represent a serious deficiency in the Australian educational system, and it is a problem to which I will devote considerable attention upon my return.

Teaching of On-the-Job Users

The third group of people whom we need to consider when discussing the teaching of technical communication is the on-the-job user. Included in this group are people who vary from th engineer and scientist working in a research laboratory or production department to the telephone technician designing a form to be used by persons bidding for disposable equipment.

There are very large numbers of these technical writing courses in Australia, just as in the U.S.A. Here lies the real textbook market. As a preliminary to my discussion of this group, let me introduce you to some Australian educational jargon.

First, we tal' of primary, secondary, and tertiary education. Tertiary education re[illegible]n to education undertaken after the student has completed twelve years of pri[illegible]ry and secondary education. The tertiary sector contains universities, colleges of advanced education (C.A.E.'s) and technical colleges. The universities have existed as a institution for over 100 years, and are based upon English models. The C.A.E.'s have existed as an institution since 1964. They were set up to educate persons for specific job openings in the Australian environment.

An example might make the distinction between university and C.A.E. clearer. The University of Queensland runs a course in computer science at post-graduate level. Its aim is to turn out persons equipped to solve problems in their specialist fields using the computer as an aid. Queensland Institute of Technology, in spite of the fact that none of the words "college of advanced education" appear in its title, is classified as a C.A.E. We run an under-graduate course in computing within our School of Business Studies. Students end up with a major in accounting as well computing and processing of business generated data. You will note that our course is very specific, and, if you took it, you would find it much more concerned with day-to-day problems than the university course.

In addition to universities and colleges of advanced education, we also have technical colleges. These institutions award certificates to technicians, and two year tertiary diplomas (the equivalent to your two year associate degrees) to middle range professionals. Middle range professionals supervise

the work of others, but are in turn supervised by professionals with baccalaureate or higher degrees.

Within the C.A.E.'s and technical colleges from certificate to postgraduate diploma level, students in some instances undertake one or two courses in technical communication. Let me describe the situation at Q.I.T. again to illustrate the scene. We have Schools of Built Environment, Science, Business Studies, Engineering, and Law. Almost every course from Quantity Surveying to Accounting has at least one communication subject as a compulsory course in the program. We offer two basic courses, one in written communication and one in speech communication. In general, we use American textbooks because, for the reasons that I have outlined, they are still the best available for our purposes.

Just above I used another jargon word, postgraduate diploma. As the name implies, this is an award for a course of study undertaken after baccalaureate level. Again the aim is to equip the student with a specific skill or set of understandings. Usually there is a strong concentration upon the practice of some profession. Examples would be postgraduate diplomas in town and country planning or in business administration. Usually, also, no thesis is required.

Conclusion

As we have seen, there is a need to develop, within Australia, courses which can be used to develop teachers of technical communication and fully trained professionals. Until this happens, the field will not be fully developed, that is, we will not have the interchange between research, writing, and practice which has, for example, led to such a spectacular increase in our ability to manage organisations.

I could sum up the Australian situation by saying that we are like the U.S.A. in the early 1950's as far as technical communication goes. There is an interesting challenge awaiting persons who wants to take it up, although the area of technical communication may be very different from the one with which the American professional is familiar, and he/she could do well to check closely before transferring to what might seem a comparable situation.

TRAINING APPRENTICE EDITORS

Freda F. Stohrer
Department of English
Old Dominion University

Training teachers to staff the growing number of courses in technical writing is a difficult business because the pertinent subject matter is as varied and as complex as the communication tasks performed for business and industry. Experienced technical writers point out that they learned much of their job after they went to work because their education was traditional and one-sided. Working engineers discuss their lack of preparation for daily communication tasks. Experienced successful teachers of technical writing often note a similar lack in their academic preparation, and like the technical writers and the engineers, they have had to make up the deficiency on the job--not by teaching on campus, but by writing or editing for an engineering firm, an aircraft manufacturer, a government agency, or other enterprise. These instructors argue that practical experience should complement academic preparation for future teachers of technical writing. In fact, daily ongoing participation in the writing/editing world can be critical in developing a realistic understanding of writing situations in the workplace.

At Old Dominion University (ODU) we give students such practical experience through an editing venture developed in cooperation with the NASA Langley Research Center (LaRC). The university and the agency have entered into a cooperative agreement whereby LaRC supplies office space, special dictionaries, style manuals, and other editorial apparatus. The

university contributes an editing team made up of an English instructor and two graduate students, one from English and one from engineering. The university team works with a LaRC senior technical editor to prepare scientific and technical reports for publication. Now in its fifth year of operation, the venture provides students with on-the-job training and income while supplying LaRC with the additional support needed to maintain publication schedules.

Our work with LaRC began when the Scientific and Technical Information Programs Division (STIPD) discovered that personnel loss and other problems had led to an unacceptable backlog of unedited manuscripts. In short, publication had fallen behind schedule. After discussing the situation with their Office of University Affairs, people in the Technical Editing Branch, STIPD, went for help to Old Dominion University.

The LaRC proposal coincided with the special responsibilities given ODU by the Commonwealth of Virginia. As an urban university, ODU has the responsibility to develop programs to assist a growing metropolitan area. The university catalog states that "While basic or pure research is encouraged, emphasis is given to applied research. . . ." Consequently, the chairman of the English Department recognized that although the proposal was non-traditional, it was the sort of thing the department should undertake. An English instructor who held a B.S. in chemistry in addition to the M.A. in English agreed to coordinate the program, the necessary paperwork was completed, and the project commenced. Three years ago the department reassigned management of the contract to an instructor with traditional humanities credentials and production continued apace.

Over the past few years the role of our university team has gradually taken shape. The Technical Editing Branch provides the university team with rough drafts of reports written by LaRC scientists and engineers, the content of which has already been approved by an editorial board of experts. The concerns of the Technical Editing Branch and the university team are organization, consistency, and accuracy. Under guidance of a senior editor, we review each draft for organization and English usage, correlate text and visual aids, check tabular layout and manner of mathematical presentation, rewrite troublesome sentences, correct symbols to coincide with agency policy, and proofread the entire document from front to back. We then interview the author, mark authorized changes in the text and back matter, and otherwise prepare the manuscript for the typists who will produce camera-ready copy. If we have time, we also mark the original figures for publication.

On the whole, the requirements of the job determined the qualifications set for the apprentice editors. The English editor needs graduate status, a solid grounding in English grammar and usage, and a general familiarity with college mathematics, preferably through trigonometry. The engineering editor needs senior status and satisfactory (i.e., "A" or "B") grades in Freshman Composition and Technical Writing. Both must plan to be in residence for the upcoming academic year. These qualifications are minimum if we intend to provide a continuity and consistency of product. Each member of the team must possess basic competence or our production rate falls off. Any prolonged slowdown shows up quickly on the record. In addition, the university promises the two student editors at least basic

training in the type of editing done in the Technical Editing Branch. We cannot make good on this promise to the students if they lack the necessary skills. English majors who cannot recognize a compound sentence, a pronoun-antecedent error, or a dangling modifier waste everyone's time. Someone must edit behind them for these errors; conference time must be spent reviewing standards instead of editing procedures. A deficiency in mathematics causes similar problems. Students cannot check consistency of symbol use when they do not understand subscripts. In like manner, the editor from engineering must spot deviations from standard mathematical procedures or lack of agreement between statements in the text and graphs in the figures. The engineering editor should also understand clear writing and recognize obviously flawed sentences. Often the engineer can suggest stylistic changes that the language specialists miss because he or she understands the process under discussion and how to clarify it. And everyone must help proofread.

As in other editing work, our duties are many; they vary from the merely exacting to the tediously irksome. Specific procedures differ from paper to paper. Every new apprentice begins with practice on proof copies of published papers; responsibility for routine tasks on current work is gradually added; and after some four to six months, I expect him or her to assume equal responsibility with the other student editor. Throughout the tenure of each student editor, more experienced editors check the work of the less experienced. The junior member of the team reads each report first, jotting down symbols, references, tables, figures,

and first mention of each. The second student editor follows with comments on organization, style, and coherence of subject matter. The English instructor pulls their comments together, makes final decisions, and conducts the author interview. The senior editor gives the paper a final review before sending it to the typist.

Clearly, three or four people cannot work on a single report at one time. For this reason, the team may be working on as many as five reports at any given time, each report in a different stage of completion. The graduate student in English may have begun preliminary proofreading on one report; the graduate student in engineering may be verifying the consistency of text and tables in another report; the English instructor may be conducting an interview with the author of a third report. The team meets weekly 1) to discuss major concerns about the reports underway, 2) to move reports from one stage of editing to another, and 3) to resolve difficulties which any individual may have with new or different problems in a current paper. Although the weekly meetings are regularly scheduled, any member of the team may request an extra conference with any other member whenever necessary, and everyone is encouraged to make suggestions about improving the editing process. We are thus able to maintain flexibility and to promote production.

The method of the apprenticeship has not yet been standardized, and I suspect that training will remain very much an individual matter. To date, I have used a patchwork approach in training new apprentices. I have charged the new editor to learn preliminary matters step by step, and I have added new tasks thereafter according to the needs of reports

currently in process. This method can be cumbersome and time consuming, but we have no "procedures" manual and new editors arrive with different assets and liabilities. And we try to give our apprentices much the same advice and experience given to the junior editors in the Technical Editing Branch.

The schedule and procedures described above are typical, but they do not indicate the different degrees of proficiency achieved by different students according to their individual backgrounds and temperaments. One student never passed the proofreading stage, largely because she never learned the standard LaRC policy governing English grammar and usage; without fail, her comments added error. Other students have gone on even to supervise work on assorted papers. Working directly with the senior editor at LaRC, they have conducted the author interview, marked the paper and figures for publication, and taken responsibility for the overall success or failure of those jobs.

Although our program has graduated only a few students, those who have sought positions teaching technical writing have found them. Their success follows largely from their productive exposure to the world of technical reports, writers, and editors. Students learn to meet production deadlines, they learn to work with other people, they learn practical editing methods, and they learn the value of effective writing in the technical world. They also discover that they need not specialize in electronics, physics, or chemical engineering to make worthwhile suggestions to people writing reports in these fields. English majors lose their fear that they have nothing to offer writers in science and technology;

engineering majors build a respect for a neat clean style. Both come to appreciate the realities of the marketplace.

The ODU agreement with LaRC has provided a solid base for our apprentice program and we plan carefully to build on that foundation. Our effort so far has been small, but it has been thorough. In the future we shall continue to offer our services only when reliable training for our students will result. We have learned that we can offer a solid product for honest dollars. Those of us who work with words have a marketable skill. We need to insist upon taking that message to our more traditionally minded colleagues. Other specialists on university faculties work as consultants to business, industry, and government. Why not members of English departments? Indeed, if we wish to continue to attract bright and realistic students, we must enlarge our scope to bring in new funding. We must be willing to offer a visible product for dollars received. And for our efforts, we may regain a measure of respect from the American businessman.

A COURSE ON 'THE ROLE OF GRAPHICS AND AUDIOVISUALS IN TECHNICAL COMMUNICATION'

-- David L. Carson
-- Craig Harkins
Rensselaer Polytechnic Institute
and
IBM

Introduction

Rensselaer Polytechnic Institute (RPI) has offered a Master of Science degree in Technical Writing and Communication for more than 20 years. As with most technical communication efforts, prime emphasis is placed on the writing dimension, with relatively less on the communication one. This has led to the following question of concern: Are we turning out graduates who approach their actual job assignments from the perspective that a "communication" problem is automatically a "writing" problem?

Although degree requirements demand that students acquire six credits in communication theory, until the 1977-78 academic year, we had made only superficial efforts to relate the practical aspects of technical writing with the theoretical areas of communication.

In 1975, Jay R. Gould, RPI emeritus professor of communication and a founder of the institute's technical communication programs, surveyed M.S. graduates with a 12-question instrument. At that point, most of the respondents had several years of on-the-job experience in industrial environments. One question asked: "Can you suggest other kinds of technical communications that should have been given in the Rensselaer program?"

Results were revealing.

A significant number of former students replied that performance in their present work would have been enhanced if they had received formal training in the following areas (listed here in order of frequency): audiovisuals, photography and art work, printing and typesetting, layout, and graphics.

This information, enlarged by an intuitive sense that any modern program in technical communication could not be complete without a course in graphics, led the senior author of this paper, as director of the RPI Masters' program, to take steps to integrate such a course into the program. (His determination was enforced, incidentally, by the testimony of several graduates of Minnesota's program at the CPTSC meeting in 1977.)

Thus, it was in response to a need that was intuitively-felt, empirically-validated, and supported by widespread testimony that such a course was designed.

We began the process of formally creating an advanced course to be offered in the fall of 1977. In our initial discussions, we decided that the course should not aim to produce typesetters or TV production specialists, but it should, on the other hand, provide the students with a general working knowledge of audiovisuals, photography and art, printing, typesetting, layout, and the principles of applied graphics.

Course Design

The most difficult aspect of planning such a course involved achieving an appropriate balance between theoretical and practical approaches. On the one hand, we wanted something that would bridge the gap between the general communication theory training (that students were receiving as part of the program) and their technical writing courses; on the other, we wanted to provide them with solid, hands-on experience in the use of graphics and audiovisuals. Problems in achieving the latter objective were increased by a lack of adequate production facilities (and no funds to acquire them).

Theory Vs. Practice

In retrospect, the most fortuitous aspect of setting this critical balance point lay in our own personal proclivities -- with one of us being heavily prone to emphasize the theory, the other feeling just as strongly that the course primarily should be a practical one. This situation led to extensive dialogue between us, and from the friction of our opposing ideas emerged a course that we feel met our dual objectives satisfactorily.

We decided to devote the initial two weeks (out of 15) to theoretical consideration of the application of visual thinking to technical communication; the next six weeks to graphics (from a practical standpoint); then, six weeks on audiovisuals (again, emphasizing the practical); and the final week to reviewing theory in terms of the content of the preceding 12 weeks.

From more than a score of texts reviewed, we selected Turnbull's and Baird's The Graphics of Communication (Holt, Rinehart and Winston, 1975) and Woelfle's A Guide to Better Technical Presentations (IEEE Press, 1976) as the required books. Another ten texts were placed on reserve in the RPI library.

Course Objectives

We set these two objectives for the course: (1) to broaden the perspective of potential technical writers to the role of graphics and audiovisuals in solving today's technical communication problems, and

(2) to provide familiarity with the uses and production techniques of various visually-oriented media.

Class Content

The initial class was opened by Dr. Thomas Pearsall, of the University of Minnesota (who happened to be visiting with us at the time). Professor Pearsall spoke on the relationship between graphics -- and other visual elements of technical communication -- and his own approach to audience analysis.

Theory

During the remainder of the first two weeks, we presented lectures which emphasized the central points of information theory and the innovative ideas of Marshall McLuhan to enlarge student understanding of the theoretical perspective being stressed.

Graphics

Lectures on visual phenomena, layout, typography, printing, and stock selection supplemented student reading, and field trips to the local newspaper and a nearby, high-volume printer enabled students to enlarge their cognitive perceptions by watching theories become process.

Guest lectures were presented by Herbert Kopper, RPI's chief graphic designer; and Dennis Norman, who (at that time) was in charge of the school's printing and binding operations.

Audiovisuals

Students were shown films, video tapes, and slide dissolve effects.

Guest lectures were provided by Professor Frank Hammet, who teaches film and visual theory at RPI, and by Robert Zittel, an instructional media specialist at the institute. In addition, Zittel conducted a hands-on video workshop, during which the class made three five-minute videotapes and received exposure to camera operation, sound, lighting, and control room operations.

Overview

The final week of the course was devoted to reviewing the students' practical experiences in terms of the theoretical ideas developed during the course's opening two weeks.

Assignments

Students were evaluated on the basis of three assignments. At the mid-term point, an 83-item test was given, covering the content of both

basic texts, selected readings from the reserve list, and lectures given to that point. Each member of the class also had to turn in a graphics assignment (e.g., brochure, logo design, advertising flyer) and make an audiovisual-oriented presentation (e.g., film, videotape, slides, demonstration).

Student Reaction

Participants in the course expressed considerable satisfaction with the results attained. Attendance at all lectures was consistently high, and enthusiasm was apparent.

On formal evaluation sheets, students were asked to rate the course in terms of instruction (knowledge of subject, fairness, ability to communicate, ability to stimulate interest) and course (organization, demands, grading, value to you). A scale of 1-5 was used (with "1" being the best). The overall instruction rating was "1.1" and the course rating was "1.5."

Here are some typical comments which appeared on these evaluation sheets:

> "...field trips were an excellent plus to the course and added a great deal of interest to the material. The course itself is well organized, has no excessive demands on the student, has been fairly graded & probably will be the one course at RPI that was the most valuable for me!
>
> "...very worthwhile. It made me aware of the integration between graphics and the written text. It also showed me how to handle graphics."
>
> "...Good course -- must be difficult to organize because you touch so little on so many subjects. I think I learned a lot!"

There were almost no negative comments. Where students did express reservations, they were mild and had to do with either the lack of professional facilities or a perceived over-emphasis on theory.

Conclusion

In net, we are more satisfied with the course than we expected to be. For a first time effort, it went remarkably smoothly. We would recommend the inclusion of such a course in any technical communication program.

RECIPE FOR A COOPERATIVE TECHNICAL EDITING PROGRAM

Bruce M. Kantrowitz
New York Sea Grant Institute
at
State University of New York and Cornell University

New York Sea Grant Institute and Rensselaer Polytechnic Institute's graduate program in technical communications cooperated in a technical editing program during the fall semester 1977-78. Students evaluated and then edited or rewrote scientific manuscripts written by Sea Grant's researchers. Twenty-five manuscripts were divided among 27 students. At the time of this article ten are in the process of author review and final production for publication. One feature article has been accepted for publication. Four other features are in editorial review. Students evaluated the program as well worth the effort, 4.4 on a scale of 5 for educational value and 3.8 for job satisfaction.

Sea Grant is set up to do for our waters what Land Grant has done for our land. And like Land Grant, Sea Grant is directed toward usable research, education, and extension activities.

Sea Grant is a cooperative federal and state program, parented by the Department of Commerce through the National Oceanic and Atmospheric Administration. There are 25 other Sea Grants in the country.

New York's Sea Grant is set up as an consortium between the State University of New York and Cornell. The cooperative extension network of Sea Grant is directed from Cornell and the research programs are run from SUNY.

New York Sea Grant is not a large program. This year (1978) we've been funded for $1.4 million federal and $741,000 non-federal from university, state and industry sources (figure 1). Disseminating results of research, education, and extension activities is one of the central roles of Sea Grant. About $50,000 is earmarked for program and research communications.

We may not be a large program, but we aim for a large impact. For the past few years, we've been able to boast the revenues generated by our projects within the State to have exceeded the State's expenditures on the program. That's what we

mean when we talk about usable research, education, and extension projects.

While it may sound like jargon to the uninitiated, that's a real and attainable objective for Sea Grant. Let me give you an example.

This can of chowder says a lot of what Sea Grant is all about; and it represents research so usable you can taste it. I'll share our recipe.

Waste has always been the number one problem of seafood processors. Over 50% of this can is what we think of as waste--stuff never used before.

You don't have to boil clams to make a good clam broth, found a pair of Sea Grant researchers from Cornell, Lamaratine Hood and Robert Zall. They studies clam processing at Shelter Island Oyster Company on Long Island and learned that during the process of mincing clams, processors run clams through three washes to remove sand and bits of shell. Disposing of this wash water costs one company $35,000 annually=-a real disposal problem--until Drs. Hood and Zall blew the whistle.

They warned Shelter Island, you may be throwing out the clam with the wash water.

Instead of dumping that water, they suggested the company recycle it. Examining the water after each wash cycle, they found besides the sand and shell, the water contained quite a lot of protein materials and clam taste. And after each cycle it contained even more protein and tasted even better.

Strain the sand and shell from the water, noted Hood and Zall, and as a by-product of the clam mincing process, you've made a tasty and marketable clam broth from the wash water, and you've solved a disposal problem.

Chemical analysis reveals the product contains more protein than most clam broths on the market; taste panels reveal it tastes just as good.

The researchers wrote up a paper for Sea Grant to document their research. We'll come back to that.

But it didn't end there, because the research wasn't usable until someone was doing something useful with it.

So a group of Sea Grant researchers put their heads and products together and created this chowder.

-it also contains scallop mantles, about half the scallop and a part generally dumped back into the sea in America;

-mechanically deboned minced fish from remains of fish after the filleting process, and

-deboned fish from species too bony to be valued for human consumption. Dana Goodrich, a marketing research specialist from Cornell's Agricultural Science Department, developed packaging and test market strategy for the product. The test marketing created such a demand in Rochester and Ithaca, New York that commercial processors are considering taking over product production. It has been estimated, production will draw 15 tons of fish a day, boosting fishermen's daily income by $9,000.

New products for the fishing industry and a successful run of test marketed chowders makes this research irrefutably 'usable.'

The creative integration of the research, often has greater value than the research documentation. The whole can of chowder is more significant to us than the sum of its parts, research write ups that contributed to its development. But we still have those parts and recognize some responsibilities to them.

Seafood processors aren't the only ones who have a waste problem. At Sea Grant we have a waste problem, too, with our manuscripts. Many times that's because they're not editorially suited to our diverse audience, so they never achieve the impact they warrent.

In the educational process there is often waste, too. I remember as a student in technical writing, spending time on hypothetical manuscripts, hours that undoubtedly refined my editorial skills and boosted my confidence, but left me with little more tangible than a disposal problem.

So I went to talk to Dr. Carson at RPI to find out whether his students were still looking for some of the things I had wanted as a student: money, portfolios, and professional exposures.

Being an alumnus of RPI's Technical Writing and Communications program, I was acquainted with their pragmatic approach to technical communications, and had confidence in the quality of the faculty and students. I knew something of both Sea Grant's and Rensselaer's philosophies. I thought they were compatible. So I set out to convince Dr. Carson of that, and see if we could develop a program together to solve both our waste problems.

Dr. Carson had a few concerns:

-Was Sea Grant prepared to treat the students as professionals in return for their professional services?

I told him I was prepared to pay a consulting fee to any student who submitted professional quality work.

-And would the students be receptive to the assignment?

It was August; we could only wait and ask them. Dr. Carson said he would put the issue up for vote a few weeks into the class.

A few weeks later Dr. Carson alerted me that his students had approved the arrangemnet unanimously. He asked me to come to RPI to orient the students with Sea Grant and the "program." And bring enough manuscripts for 27 students, he added.

Thus Dr. Carson and I entered the program with a leap of faith. He didn't know what to expect from my manuscripts, and I didn't know what to expect from his students.

PROCEDURE

Initial resistance was abundant.

-Though the students had voted to participate in the program, some were ready to change their votes when they saw the

length or complexity of the manuscripts, and projected their additional course load for the semester. Some feared they had overcommitted themselves.

-Sea Grant's researchers, uncertain about the quality of student efforts, nevertheless applauded the innovative program, as long as students worked on some other researcher's manuscript.

With insights from experience and a commitment to "learning by doing," Dr. Carson dissuaded me from wasting time developing a procedure. He recommended instead, maintaining a program flexible for us to make any necessary changes in response to student feedback. Consequently, we didn't follow a procedure; rather it followed us.

We started with just a few guidelines:

Faced with resistance from our researchers, I made two decisions: students should not set blue pencil on manuscript until they had proposed and cleared their editorial approach with me. And students should not contact authors.

And hearing the resistance from his students, Dr. Carson imposed another: Students should not communicate with Sea Grant until they had reviewed their manuscripts and written up their preliminary assessments.

With these two guidelines, and little else, we proceeded.

Selection--From Sea Grant's files, I collected and reviewed an assortment of manuscripts. I looked for usability and currency. When necessary, I drew on subject area specialists for evaluations. Judgement at this stage was critical; clearly, the more unusable material we culled at this point, the more publications could result from the program. I selected 25 manuscripts to be divided among 27 students.

Portion control--To sort the stack into even workloads for 27 students, I assembled 21 editorial packages (table 1).

- Of these, six were long manuscripts requiring two collaborators;
- eleven were manuscripts that could be handled by one editor;

table 1:
THE AVERAGE MANUSCRIPT (time spent in hours)

	Low	High	Number of Respondents	Average
Expectations	8 hrs	72 hrs	24	28 hrs
Actual	11	90	22	46.2
Breakdown				
Original Assessment	1.5	10	16	5.2
Consultation	1	5	8	2.9
Reading	4	15	16	8.1
Research	1.5	8	13	3.8
Team consultation	5	15	11*	16.0
Final Edit	3	25	21	12.8
Typing	3	11	9	7.3
Rewriting	5	30	15	17.7
Mechanics	.5	34	15	21.0

* (12 or 44% of class on teams)

four packages were pairs of shorter manuscripts, each package intended for a single editor.

Distribution--I numbered editorial packages 1-21 and noted packages intended for teams. Dr. Carson distributed these packages, forming editorial teams when necessary.

Orientation--I oriented the class on Sea Grant and its publication policies. I told them that through Dr. Carson I had invited them to serve as Sea Grant's editorial consultants. Sea Grant's style sheet was made available to the class for reference. After some discussion, typing guidelines as stated in style sheet were modified.

I outlined the first segment of the assignment--preliminary assessment.

Preliminary Assessment--Before editing the paper, I told them, I expected from each editor or editorial team an evaluation of the manuscript and recommendations for editorial treatment. This should include a prospectus of level of edit, amount of rewrite, reorganization, and projected audience.

Conference--The preliminary assessment conference was a chance for me to meet with the students, discuss their approach to the manuscript, and help them develop strategy.

After I had received all preliminary assessments Dr. Carson directed the editors to schedule conferences with me. I encouraged editors to come to my office for the conferences, but told them that I would also accept telephone conferences; and if necessary, I agreed to spend an afternoon at RPI to meet with any who preferred a face-to-face session, but could not arrange transportation to Albany. Two resorted to phone calls. The rest met with me at the Sea Grant Office.

During these conferences, in addition to the points raised in their assessments, we also discussed the editor's time expectations and, in the case of teams, how they had decided to divide up the workload.

It was the kind of session they might expect to encounter in any later editorial consulting, where they would be

selling their approaches and strategies.

It also set my mind at ease. Without this session, their final draft would be a surprise to me, and some might be treated inappropriately for Sea Grant's needs. I had visions of some of the more creative studetns taking on tasks like rewriting our technical report in the style of e.e. cummings.

I frequently played devil's advocate, requireing much persuasion that the approach they had selected would be appropriate. All in all, their approaches were appropriate and ambitious.

After hearing the editor's assessment and recommendations, I described the manuscript pipeline at Sea Grant, including technical, author, and extension reviews, then shared reviews on the manuscript in question.

Whenever we concluded the manuscript would need updating, I provided other publications from the Sea Grant office or referred the editor to a Sea Grant researcher (but not the author), or extension specialist who could provide more information. I made it a policy to forewarn the contact I had given his name as reference on the topic. In all long distance zones, I suggested the specialist call the editor. At the same time Dr. Carson encouraged them to use the varied faculty, student, and library resources at RPI.

With this minimal guidance, the students were on their own.

Some Illustrative Case Histories

Editors brought their own expertise and resources to the task. In some cases they changed my expectations for the final product.

. Ms. Zych, a librarian at SUNY, was critical of the spurious bibliography and citations she found in her editorial package. She recommended and performed some follow-up at the card catalog that enhances the scholarship of her manuscript.

. Mr. Orbeton was aware of legislation that supplanted legislative references in his manuscript. He recommended a legisla-

tive update and a new article building onto the original manuscript the impact of more recent laws on power plant siting.

. Ms. Squires recommended enlisting the help of an RPI engineering professor to clarify some technical ambiguities in her manuscript.

. Mr. Masse was assigned a manuscript that criticized the International Joint Commission for its lack of impact on Great Lakes Water Quality. With his editorial package, I had given him an article from Spectrum that described another side to the IJC's function and accomplishments. Mr. Masse concluded that the original manuscript had unfairly criticized the Commission for being ineffective in matters outside its jurisdiction. He prepared his own article that reconciled the two points of view, clarifying the IJC's role.

Clarification--Also at the conference, final requirements were clarified.

Editing--Students were given about a month to carry out their editorial recommendations.

Submission--For final submission I required a final draft, a letter of transmittal, and an author cover and technical review request (if necessary).

. Letter of transmittal certified that the editor had, in fact, performed work for us--all this so that I could pay them.

. Final draft: I asked that the final draft be submitted in such condition that a typist would find it self explanatory. If anyone knows of that exceptional typist, master of hieroglyphics and telepathy, please notify me. In all cases these 'final drafts' have required typing and editing.

. Author sheet: I asked that an author sheet be submitted pointing out to the author any major changes and justifying those changes. The sheet would also call attention to any points that required the author's clarification or rewrite. I asked that these sheets reflect the approach the editor would actually use if he were to follow up on the manuscript with the author.

. Technical review sheet: This would accompany final edit if editor recommended it be resubmitted for technical review. This was an acceptable way for a non-technical editor to deal with technical subject matter and was also a good device for overcoming editor intimidation by technical manuscripts.

Grading--I graded papers on:

. fulfillment of editor's commitments as expressed in the preliminary assessment and conference, (Each editor who fulfilled those commitments was paid a consulting fee.)

. initiative: each editorial package provided hours of entertainment if the editor was willing to invest those hours. In short, I looked at how much work the editor had done, and how thoroughly the potential of the manuscript had been tapped.

. technical quality and readability;

. approach: I looked at the organizational approach to the editing assignment.

. professionalism: I also considered professionalism as reflected in presentation of final draft, letter of transmittal, and approach to author.

Follow-up: Authors and Production--As I graded these papers, I routed a few of the outstanding edit jobs and approaches to the authors for review. In a few cases, I was even able to forward the editors' correspondences to the authors directly. My cover explanations to the author made no mention of the nature of the project or status of the editor.

At that point, we discuss the specific points with the author to produce a mutually acceptable product. We then typeset or retype the piece, based on those conclusions. The author receives a final copy for his approval. He signs and dates it.

) The manuscript is ready for printing.

Results

Of the manuscripts rewritten, one editorial and five features emerged. One of those five features has already been accepted by Coastlines, Sea Grant's statewide newsletter, circu-

lation 5,000. That feature, in fact, summarized the research I've already described on converting clam wash water into a marketable product.

Of the 23 manuscripts edited, ten have started through the pipeline--submitted for approval by authors, retyped, and laid out for publication. Though these represent the highest priorities and the most competent treatments, they are certainly not the only products worth publishing from the program. As these are published, others will replace them in the pipeline.

My early assessment is that at least half the final drafts submitted are acceptable for follow up.

Discussion

How beneficial was the program to Sea Grant? We asked the students that. Students ranked the benefit to Sea Grant at 4.0 out of 5. I would rank it about the same (figure 3).

But mine is a preliminary evaluation, since clearly, so much depends on the publications yield.

From a financial perspective, for example, it's early to evaluate the program until we have all the papers published that we can publish. Considering student stipends, and staff professional and clerical time, we spent an average of $160 on each manuscript. At the lowest estimate of usability, ten publications--or 40% of those assigned--would place our expense somewhere around $400 to $450 each. A realistic expectation would be about 15 publications, or about $280 each.

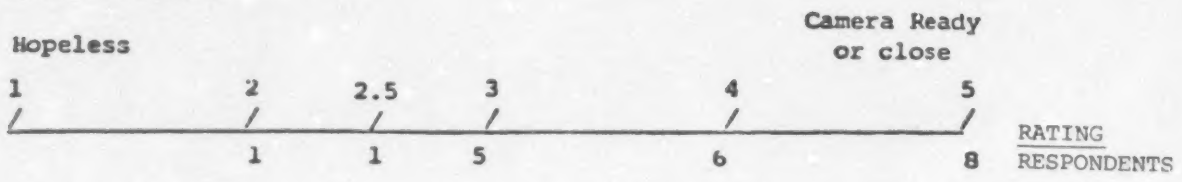
In all fairness to discussion of cost effectiveness of the program, I should note that some of the manuscripts unpublishable at the close of the program were unpublishable because of dynamics of politics, fate, and judgement, independent of student efforts.

figure 2:

84

STUDENT EVALUATION OF PROGRAM

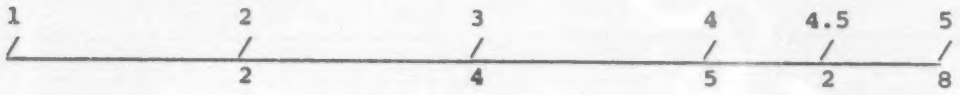
PUBLISHABILITY



Respondents 21
Average 4.0

85

figure 3:
BENEFIT TO SEA GRANT

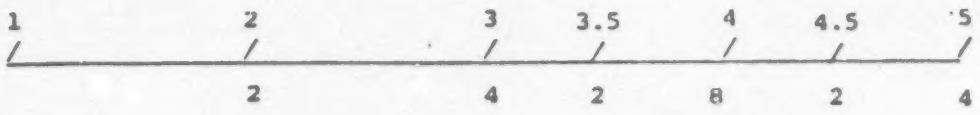


Respondents 21
Average 4.0

figure 4:

86

STUDENT EVALUATION OF PROGRAM
JOB SATISFACTION



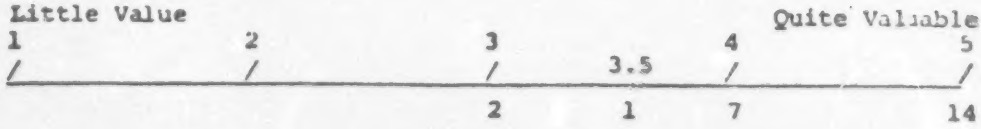
Respondents 22
Average 3.8

87

STUDENT EVALUATION OF PROGRAM

figure 5: EDUCATIONAL VALUE

(Student Benefit)



Respondents 24
Average 4.4

Appendix

Other Comments from Student Evaluation of Program

"Needed more time."

"Too much pressure from other assignments."

"Did not fit into class structure."

"Fit well into class structure."

"The frustration over how the project did not fit smoothly into the class structure was enormous. Every time I got started on the manuscript again, some new assignment--new product development, survey report, prospectus--would crop up..."

"...did not feel qualified to rewrite technical passages without affecting the content."

"...the entire program should be outlined in total. There tended to be too many surprises."

"Perhaps it was good that we were left pretty much to our own devices as to how to handle the manuscript. Sometimes the best way to learn things is by discovering and testing them by yourself."

"...refreshing to work on a 'real' paper."

"An excellent opportunity to experience a 'real' job situation."

"Real life experience is a nebulous concept, contrary to popular opinion."

"Would like to spend more time...so that no loose ends remained...this puts a limit on job and product satisfaction."

"Highly recommend continuing this program in the future."

SOME BEGINNINGS IN RESEARCH FOR TECHNICAL COMMUNICATION

by

Leon C. Hull*

To speak of "beginnings" seems to imply that we are just now starting to undertake the first real research in technical communication. This is hardly the case. True, the journals in our field are not heavily weighted with theory and the results of empirical studies. But there are at least two bodies of literature that can help us in charting the course of future research in technical communication. One is the readability studies conducted by researchers in education and psychology. The other is the efforts of the Armed Services to increase the literacy of their recruits and the useability of their manuals. I propose to discuss some of this research in readability and useability that relates directly to technical writing.

I shall not attempt to review half a century of readability research, except to note that Flesch's "reading ease" formula was published in 1948, and that the readability formulas most commonly used today--Flesch, Dale-Chall, Gunning--were developed about thirty years ago. For those who may wish to refresh or update their knowledge on this subject, I would recommend the excellent summaries by Klare (1963, 1974-1975) and a recent survey of the literature by Williams, Siegel, and Burkett (1974).

The Armed Services have been involved since World War II in finding ways to improve the functional literacy of personnel and the effectiveness of job performance aids and training materials. Studies by the Army, Navy, and Air Force agree that there is a serious literacy gap between the reading ability of military personnel and the difficulty (reading grade level) of the written materials they are required to use. There are four solutions to this problem: (1) more selective recruiting; (2) limited assignments for marginal recruits; (3) training to increase general and functional literacy; and (4) more understandable written materials. These solutions have been tried, separately or in combination, with moderate success. The best summary of these efforts is by Sticht and Zapf (1976), who edited the proceedings of a three-day conference on "Reading and Readability Research in the Armed Services" held at Monterey, California, in the fall of 1975.

More directly applicable to technical writing is a little-known survey by Ronco, Hanson, Raben, and Samuels (1964). These authors sought to identify the characteristics of technical reports that affect reader behavior. Their report, which was sponsored by the

*Director, Technical Information Division, Naval Underwater Systems Center, NewPort, Rhode Island

National Science Foundation, comprises a bibliography with 411 entries and abstracts, and a 48-page summary and evaluation of research findings gleaned from a review of the literature on communication, technical writing, information theory, education, and cognitive and motivational psychology. They conclude that there is "surprisingly little experimental data concerning technical reports. And what little there is, is of questionable value--at least for the solution of the practical everyday problems faced by the technical writer."

Let us turn now to a few gleanings from the literature cited in the preceeding paragraphs. From 1955-1958 the Air Force sponsored an extensive series of experiments designed to study the relationship of a wide variety of communication, textual, and readability variables to the comprehension, learning, and retention of technical materials. These studies by Klare, Mabry, Gustafson, and others showed that:

> Increasing readability increased immediate retention and reading speed.
>
> Use of personal words did not increase the interest or acceptability of the material.
>
> A high level of human interest in technical writing made no difference in retention and was judged less acceptable.
>
> Content was more important than style in determining how well material will be accepted.
>
> An easy style produced higher efficiency and retention.
>
> Higher levels of organization did not increase reading speed but had a positive effect on acceptability of the material.

Between 1962 and 1974, R. M. Davis, who teaches at the Air Force Institute of Technology, conducted three series of experiments in which he varied several factors pertaining to mechanical description (drawings versus verbal description, use of internal structural aids), copy preparation and reproduction (margins, corrections, and print quality), and expression (sentence length, subject-verb agreement, consistency of viewpoint, number of misspelled words). Effectiveness was measured by comprehension (questionnaire), reading speed, judgment of the author's knowledge of the subject, and judgment of the author's competence as a writer. Audiences differed with respect to intelligence, sex, technical inclination, prior instruction in technical writing, and knowledge about the experiment. Davis found that:

> Use of drawings increased comprehension and raised the audience's judgment of the author's competence as a writer.

Poorly typed and reproduced copy reduced the effectiveness of the message.

Errors in agreement and long sentences increased the mean reading time and adversely affected the audience's judgment of the author's knowledge and competence.

The more intelligent subjects, those technically inclined, and those with experience in technical writing understood the material better.

Sex had no significant effect on comprehension.

Although the results of these experiments by Klare et al. and Davis were weaker than expected and hardly conclusive, they point the way toward a possible methodology for measuring the acceptability and effectiveness of written technical communications. The studies are also notable in that the variables used reflect not only style, but also format, organization, content, and even audience factors.

Initial efforts by the Armed Services to assess the readability of technical material made use of existing formulas. But these researchers have come to recognize the importance of identifying and allowing for technical terms which are familiar to the user when computing readability. The FORCAST and RIDE formulas (see Klare, 1974-1975) were developed specifically to assess the difficulty of military writing. Both formulas employ a single measure of word difficulty: number of one-syllable words in a 150-word sample (FORCAST), and average number of letters per word (RIDE). Kincaid, Fishburne, Rogers, and Chissom (1975) recalculated for Navy use the Flesch reading ease formula, Gunning's fog count, and the automated readability index. The scaled reading grade levels were based on comprehension scores of Navy personnel reading Navy training materials. Thus, allowance for familiarity with a technical vocabulary is incorporated in the formulas. These recalculated formulas produced an estimate of difficulty over a grade level lower than the original formulas.

One problem with such adaptations and recalculations is that a different formula would have to be computed for each distinctive technical audience. Also, the variables employed in readability formulas, and even those used by Klare and Davis, are characteristic of writing in general and not specifically of technical writing. What is needed is a formula that is universally applicable to technical material, one which incorporates variables that distinguish such material from ordinary prose writing. Bormuth (1969) and Siegel and Burkett (1974) have identified some basic linguistic and cognitive factors that can affect the difficulty or comprehensibility of written technical communication.

Bormuth's study is particularly valuable because it provides future researchers with the product moment correlations between 172 linguistic variables and passage difficulty as measured by cloze tests. The passages were randomly selected from textbooks in biology, chemistry, civics, current news, economics, geography, history, literature, mathematics, and physics. Subjects were 2600 fourth to twelfth grade pupils in the Minneapolis school system. The final result was a battery of new readability formulas containing from three to twenty variables each. The variables used were related to vocabulary (8), syntactic structures (50), syntactic complexity (40), parts of speech (62), and anaphora analysis (12). Interestingly enough, Bormuth excluded vocabulary variables (word length and difficulty) from his unrestricted formulas because they could not be manipulated and were therefore dependent rather than independent variables.

Siegel and Burkett (1974) investigated two new approaches to the measurement of readability/comprehensibility on the basis of the intellective involvement inherent in comprehending the materials. One approach was based on Guilford's structure-of-intellect model, the other on contemporary psycholinguistics. The structure-of-intellect model takes account of the mutual interaction of six product factors, four content factors, and five operation factors. Reading selections--heavily and lightly loaded in eight of these intellective abilities (out of 120)--and associated tests were administered to 130 new Air Force recruits. Results indicated support for these conclusions:

> Comprehension of reading material increases as vocabulary diversity decreases (cognition of semantic units).
>
> Comprehension increases when semantic or word linkages are provided for the reader (cognition of semantic relations).
>
> Only essential information should be presented in figural materials (memory of figural units).
>
> Replication of facts increases comprehension (memory of semantic units).
>
> Comprehension increases when implications or syllogisms are provided for the reader (convergent production of semantic implications).
>
> Use of mnemonic aids helps to organize material and makes it more comprehensible (convergent production of semantic systems).
>
> Comprehension is increased by giving class members (examples) to the reader (divergent production of semantic units).
>
> Use of abbreviations and acronyms has a disruptive influence on comprehension (evaluation of symbolic units).

A similar investigation of various psycholinguistic determinants of readability showed that comprehension is adversely affected by transformational complexity (particularly passive-negative sentences), morpheme volume, structural complexity (center embeddedness), and use of left-branching sentences.

Many of these concepts relating to readability, acceptability, useability, effectiveness, and psycholinguistics have been incorporated--or given token recognition--in recent guidelines for technical writers put out by the Armed Services. Post and Price (1974) organize their guidelines for Navy technical manuals as a series of tests relating to organization requirements, technical communication requirements, and readability requirements. Kern, Sticht, Welty, and Hauke (1975) make effective use of before-and-after examples in their guidelines for Army training literature. These authors recommend organization by functional task and use of simple line drawings to illustrate procedural steps. The Naval Air Systems Command (1976) has developed a technical manual preparation guide that features work package organization, format and graphics that are compatible with microfilm, and comprehensibility assurance criteria. Although none of these documents is fully accepted as a military standard, they all contain much useful information and advice for the technical communicator.

These then are some of the beginnings out of which much of the current research in technical communication has developed. Perhaps the best way to tie this all together is to state some of the implications for my own future research. Basically, I propose to re-examine linguistic and other variables in order to identify those that are particularly relevant to technical material. Such an identification would permit us to define technical writing more precisely, and to develop a readability formula that is designed specifically to measure or predict the difficulty of technical material.

In this connection, it would be interesting to re-evaluate the data from Bormuth's study on the basis of technical versus non-technical subject matter areas. Those linguistic variables found to correlate more highly with technical subject matter (biology, chemistry, physics, and mathematics) than with non-technical subjects (civics, current news, history, and literature) might help us to identify certain characteristics of technical writing that distinguish it from ordinary prose writing.

Technical writing, in my view, is characterized by vocabulary diversity, greater idea density, a higher level of abstraction, a sharply increased modifier load, and greater structural and transformational complexity. Findings by Bormuth, Siegel and Burkett, Flesch, and others support this view. As one researcher put it: greater abstraction leads to increased complexity of structure and to greater precision in writing (more modifiers). My goal, therefore, is definition and measurement. The beginnings cited here offer a sense of direction. That is essential for any new beginning.

REFERENCES

Bormuth, J. R. Development of readability analysis. U.S. Office of Education (DHEW), Bureau of Research, March 1969. (ERIC No. ED 029 166)

Davis, R. M. Effective technical communications: expression--copy preparation--motivation (AFIT TR 74-7). Wright-Patterson Air Force Base, Ohio: Air Force Institute of Technology, August 1974. (NTIS No. AD-784226) This is the last of nine reports published between 1962 and 1974; references to the other eight reports are contained herein.

Kern, R. P., Sticht, T. G., Welty, D., & Hauke, R. N. Guidebook for the development of Army training literature. Alexandria, Virginia: Human Resources Research Organization, November 1975. (NTIS No. AD-A033935)

Kincaid, J. P., Fishburne, R. P., Rogers, R. L., & Chissom, B. S. Derivation of new readability formulas (automated readability index, fog count, and Flesch reading ease formula) for Navy enlisted personnel. Millington, Tennessee: Naval Air Station Memphis, Chief of Naval Technical Training, February 1975. (NTIS No. AD-A006655)

Klare, G. R. The measurement of readability. Ames, Iowa: Iowa State University Press, 1963.

Klare, G. R. Assessing readability. Reading Research Quarterly, 1974-1975, 10 (1), 62-102.

Klare, G. R., Shuford, E. H., & Nichols, W. H. The relation of format organization to learning. Educational Research Bulletin, Ohio State University, 1958, 37, 39-45. This is the last in a series of articles by Klare, Mabry, Gustafson, Nichols, and Shuford published between 1955 and 1958; references to the other articles are contained herein.

Naval Air Systems Command. Technical manual preparation guide for technical writers, editors, and illustrators (NAVAIR 00-25-700 Preliminary). NAVAIR Technical Documentation Policy and Programs Office, June 1976.

Post, T. J., & Price, H. E. Requirements and criteria for improving reading comprehension of technical manuals. Falls Church, Virginia: BioTechnology, Inc., November 1974.

Ronco, P. G., Hanson, J. A., Raben, M. W., & Samuels, I. A. Characteristics of technical reports that affect reader behavior: a review of the literature. Medford, Massachusetts: Tufts University, Institute for Psychological Research, 1964. (Clearinghouse for Scientific and Technical Information, No. PB-169409)

Siegel, A. I., & Burkett, J. R. Application of structure-of-intellect and psycholinguistic concepts to reading and comprehensibility measurements (AFHRL-TR-74-49). Wayne, Pennsylvania: Applied Psychological Services, September 1974. (NTIS No. AD-A001573)

Sticht, T. G., & Zapf, D. W. (Eds.). Reading and readability research in the Armed Services (Final Report, HumRRO FR-WD-CA-76-4). Alexandria, Virginia: Human Resources Research Organization, September 1976.

Williams, A. R., Siegel, A. I., & Burkett, J. R. Readability of textual materials--a survey of the literature (AFHRL-TR-74-29). Wayne, Pennsylvania: Applied Psychological Services, July 1974. (NTIS No. AD-785140)

Editor's Note:

In response to the requests of several members present at the 1978 meeting, Leon Hull provides the attached information on the Intergovernmental Mobility Program.

Any institution of high education is eligible to participate in the program. For additional information contact

Mr. Ronald J. Fedorowicz
Acting Director, Office of Faculty Fellows
and Personnel Mobility
U. S. Civil Service Commission
Washington, D. C. 20415
(202) 254-7316

FED 18 FACTS

on the Intergovernmental Mobility Program

Today all levels of government are interdependent. To solve their mutual problems and thereby improve their service to the public, they should share their resources. One way they can do this is through the mobility program authorized by the Intergovernmental Personnel Act (IPA).

Under the mobility provisions of the IPA, employees may be assigned from and to Federal executive agencies, colleges and universities, and State, local, and Indian tribal governments, generally for up to two years. "Mobility assignees" work on priority projects, solve problems involving different levels of government, and build intergovernmental understanding.

Which Agencies and Governments Are Eligible to Participate

On the Federal side:

- Departments and agencies in the executive branch, except the U.S. Postal Service and the Postal Rate Commission
- Government corporations and other selected independent establishments
- The General Accounting Office (but not other legislative or judicial branch units)

On the non-Federal side:

- State and local governments
- The District of Columbia, the Commonwealth of Puerto Rico, American Samoa, Guam, and the U.S. Virgin Islands
- Organizations to which State and local governments have specifically delegated a governmental function
- Public or private U.S. four-year colleges or universities, or technical or junior colleges
- Indian tribes and tribal organizations

Which Employees are Eligible to Participate

On the Federal side:

- Employees in the Federal career service
- Attorneys

Note: NOT eligible are commissioned officers in the Public Health Service; members of the armed forces; and employees serving probationary periods, holding time-limited temporary positions, or holding confidential, policy level positions.

On the non-Federal side:

- Persons who have been regular salaried employees of a State or local government or other eligible organization for at least 90 days

Purposes of an Assignment

Assignments are made for work of mutual concern and benefit to the participating governments and institutions of higher education.

A mobility assignment can be made to:

- Share scarce expertise
- Provide operating experience in a counterpart organization
- Provide general developmental experience
- Improve management of programs and make more effective use of available resources
- Strengthen intergovernmental understanding
- Transfer new technology or encourage the use of research findings

The overriding factors taken into account when mobility assignments are approved are the benefits to the participating organizations and the impact on the effective delivery of public services.

How Assignments are Arranged

The head of each Federal executive agency has the authority to enter into mobility agreements with other units of government or institutions of higher education. The employee, of course, must agree to the assignment.

Once the three parties (the Federal agency; the other government, college or university; and the employee) have agreed, the terms and conditions for the assignment are documented by a written agreement.

The assignment agreement provides a record of the rights and responsibilities of the parties involved. Copies of all agreements are kept by the Civil Service Commission's Bureau of Intergovernmental Personnel Programs.

Employee Indications of Interest

Assignment proposals are initiated and responded to by agency managers. If you are a Federal employee interested in a mobility assignment, you should so inform the appropriate program and personnel officials in your agency, bringing to their attention any specific needs

that another jurisdiction might have on which you are qualified to work.

Agency officials evaluate assignment proposals on the basis of the mutual benefits to participating agencies. An employee's personal goals and interests cannot be the basis for arranging a mobility assignment.

Status of a Participant in the Mobility Program

A mobility assignee remains an employee of his or her government or university and is thus covered by that jurisdiction's personnel procedures. However, an assignee may also be subject to certain personnel provisions of the temporary employer. Employees of both Federal agencies and State and local jurisdictions may be assigned on either a "detail" or a "leave-without-pay" basis. The decision as to which will be used is based on such considerations as assignment expenses, duties and responsibilities of the assignee, and the temporary employer's personnel policies.

Federal Employee Rights, Benefits, and Responsibilities

If you are a Federal employee and you accept a mobility assignment, you are guaranteed that your basic job rights and benefits will be protected and preserved while on the assignment.

This means you will continue receiving your current level of pay as well as in-grade increases, fringe benefits (such as retirement and health and life insurance), and both annual and sick leave. At the end of the assignment your agency must, as a minimum, return you either to the position you held before the mobility assignment or to a position of like seniority, status, and pay. You are eligible to be considered for all promotions while on assignment.

Since there are some slight differences between assignments on detail and assignments on leave-without-pay, you should review all pertinent personnel provisions before agreeing to an assignment.

You are expected to return to your original employer upon completing the assignment. The mobility program is not intended to help you change jobs.

Many State and local governments have enacted legislation comparable to the IPA, protecting employee rights and benefits.

All assignees are covered by Federal conflict of interest statutes, other legal provisions affecting standards of conduct, and by the Federal Hatch Act limiting political activity.

Travel and Transportation Expenses

A Federal agency may, at its discretion, pay or reimburse an assignee for certain travel and relocation expenses.

Agencies can pay for **either** relocation expenses to and from the assignment location **or** a per diem allowance at the assignment location during the assignment, but not both.

If you go on a mobility assignment and choose relocation expenses, you can be reimbursed for: (1) transporting your immediate family, household goods, and personal effects to and from the assignment location; (2) per diem allowances for your immediate family en route to and from the assignment location; and (3) subsistence for you and your immediate family while occupying temporary quarters at the assignment location and on return to your previous post of duty. You are not entitled to be reimbursed for the costs involved in buying or selling a home.

A per diem allowance for the duration of the assignment, however, would cover only you and not members of your family. Expenses that can be paid to you include: (1) travel to and from the assignment location; (2) a per diem allowance at the assignment location during the assignment; and (3) travel, including a per diem allowance, while traveling on official busi-

ness away from the designated post of duty during the assignment.

Travel, relocation, and per diem expenses will be paid only if you indicate on the written agreement that you will serve the entire period of the assignment or one year, whichever is shorter.

Costs of the Assignment

Salary and travel costs of an employee on assignment may be shared by the permanent and temporary employers, or be paid entirely by one. This is subject to negotiation between the two agencies. In general, an agency's share of the salary should correspond to the degree to which its interests are being met by the assignment.

Regardless of the cost-sharing arrangements, you, the employee, are guaranteed your current salary level, as well as any future pay increases that become effective during the assignment.

Examples of Positions Filled Through the Mobility Program

Assignees fill a wide variety of positions. The only positions that cannot be filled through the mobility program are those of elected officials.

Examples of recent assignments include:

- Employee Development Specialist
- Wildlife Biologist
- Soil Scientist
- Management Information Systems Analyst
- Correctional Program Specialist
- Policy Planner
- Architect
- Research Pharmacologist
- Agricultural Economist
- Director, Governor's Science Advisory Council
- Lt. Governor, Indian Tribal Government
- Federal Liaison Officer
- Personnel Director
- Policy Advisor on Urban Affairs
- County Executive

Length of an Assignment and Termination

A key feature of the mobility program is its flexibility. A mobility assignment may last from a few weeks to two years depending on the needs of the organization involved; most assignments last about a year. Under special circumstances, an assignment may be extended for up to two more years. Assignments may also be part-time, for example 20 hours per week, or intermittent, such as one week per month for six months.

An assignment may be terminated at any time at the option of either agency. Normally, this occurs when a project is completed ahead of schedule or if the desired results are not being achieved.

For More Information

Information about the specific provisions of a mobility asssignment and pertinent agency policies can be obtained from the IPA mobility program coordinator, generally located in each agency's personnel office.

General information on program activities and policies can be obtained from the Office of Faculty Fellows and Personnel Mobility in the U.S. Civil Service Commission's Bureau of Intergovernmental Personnel Programs.

FED FACTS 18 **September 1977**

U.S. Civil Service Commission
Washington, D.C.

U.S. GOVERNMENT PRINTING OFFICE 1977 O—247-934

For sale by the Superintendent of Documents, U. S. Government Printing Office, Washington, D.C. 20402 (per 100 copies)

Stock No. 006-000-01023-7

INTERGOVERNMENTAL PERSONNEL PROGRAMS DIVISIONS

Region	Address	Area Served
Atlanta	1340 Spring Street NW. Atlanta, Georgia 30309 Phone: 404-526-2448	Alabama, Florida, Georgia, Kentucky, Mississippi, North Carolina, South Carolina, Tennessee
Boston	John W. McCormack Post Office and Courthouse Boston, Massachusetts 02109 Phone: 617-223-6835	Connecticut, Maine, Massachusetts, New Hampshire, Rhode Island, Vermont
Chicago	Federal Office Bldg., 29th Fl. 230 South Dearborn St. Chicago, Illinois 60604 Phone: 312-353-5262	Illinois, Indiana, Michigan, Minnesota, Ohio, Wisconsin
Dallas	1100 Commerce Street Dallas, Texas 75202 Phone: 214-749-1907	Arkansas, Louisiana, New Mexico, Oklahoma, Texas
Denver	Building 20, Denver Federal Center Denver, Colorado 80225 Phone: 303-234-4047	Colorado, Montana, North Dakota, South Dakota, Utah, Wyoming
New York	New Federal Building 26 Federal Plaza New York, New York 10007 Phone: 212-264-4612	New Jersey, New York, Puerto Rico, Virgin Islands
Philadelphia	William J. Green, Jr. Federal Building 600 Arch Street Philadelphia, Pennsylvania 19106 Phone: 215-597-9125	Delaware, Maryland, Pennsylvania, Virginia, West Virginia.
St. Louis	1256 Federal Building 1520 Market Street St. Louis, Missouri 63103 Phone: 314-425-4941	Iowa, Kansas, Missouri Nebraska
San Francisco	Federal Building, Box 36010 450 Golden Gate Avenue San Francisco, California 94102 Phone: 415-556-1190	Arizona, California, Hawaii, Nevada, Guam, American Samoa, Trust Territory
Seattle	Federal Building 915 Second Avenue, 26th Fl. Seattle, Washington 98174 Phone: 206-442-0464	Alaska, Idaho, Oregon, Washington

GPO 880-537

PARTICIPANTS

1978 MEETING

COUNCIL FOR PROGRAMS

IN

TECHNICAL AND SCIENTIFIC COMMUNICATION

Rensselaer Polytechnic Institute

John D. Abbott
Manager Technical Documentation
Data General
Westboro, MA 01581

Professor Paul V. Anderson
Department of English
Miami University
Oxford, Ohio 45056

Professor George Barnett
RPI, Troy, New York 12181

Professor Virginia Book
University of Nebraska
108 Ag. Communications
Lincoln, NE 68583

Professor David L. Carson
RPI, Troy, New York 12181

Professor Beekman W. Cottrell
Carnegie-Mellon University
Pittsburgh, PA 15213

Professor Thomas C. Dixon
Queensland Institute of Technology
P. O. Box 246
North Quay
Australia 4000

Professor Robert W. Elmer
RPI, Troy, New York 12181

Professor Jay R. Gould
RPI, Troy, New York 12181

Professor Frank Hammet
RPI, Troy, New York12181

Dr. Craig Harkins
IBM
Fishkill, New York

Leon Hull
Chief, Technical Documentation
Naval Underwater Systems Center
Newport, RI 02840

Bruce M. Kantrowitz
Assistant Director
SUNY/NY SeaGrant Institute
99 Washington Avenue
Albany, New York 12246

Mike Kozikowski*
Graduate Student
RPI, Troy, New York 12181

Professor Bruce Linn
Montana College of Mineral
Science and Technology
Butte, Montana 59701

Professor Wayne A. Losano
University of Florida
Gainesville, FL 32611

Mark Low*
Graduate Student
RPI, Troy, New York 12181

Professor Thomas E. Pearsall
University of Minnesota
St. Paul, MN 55108

Joseph T. Rigo
President
SYSDOC Incorporated
New York, NY

Professor Philip M. Rubens
Michigan Technological University
Houghton, MI 49931

Professor Barbara Smith
Alderson-Broaddus College
Philippi, WV 26416

Karen Squires*
Graduate Student
RPI, Troy, New York 12181

Professor Freda Stohrer
Old Dominion University
Norfolk, VA 23508

Professor Thomas Warren
Oklahoma State University
Stillwater, OK 74074

Professor Francis Weeks
Executive Director
American Business Communication
Association
University of Illinois
Urbana, 61801

Lionel D. Wyld
Manager Technical Documentation
Naval Underwater Systems Center
Newport, RI 02840

---

*These students from RPI's Master of Science Program in Technical Writing and Communication presented oral presentations reflecting their responses to RPI's required course in computer science for communication majors.